UNIVERSITY OF PENNSYLVANIA

THE AGRICULTURAL INDUSTRY OF SOUTHEASTERN PENNSYLVANIA

A STUDY IN ECONOMIC GEOGRAPHY

HENRY FRANCIS JAMES

A THESIS

PRESENTED TO THE FACULTY OF THE GRADUATE SCHOOL IN
PARTIAL FULFILMENT OF THE REQUIREMENTS FOR
THE DEGREE OF DOCTOR OF PHILOSOPHY

PHILADELPHIA
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PREFACE*

THIS is a study in regional economic geography. It is an attempt to analyze the conditions of agricultural life in Southeastern Pennsylvania in order to determine its agricultural possibilities, its inherent advantages and limitations, and to furnish the background for future studies of certain of its marketing problems, the solution of which is its most vital need. In this study, the part played by geographic factors will be emphasized. The historical background will be considered only in so far as it helps to explain existing conditions.

This subject will be treated in four parts. The first part consists of a survey of the natural environment of the region, the background, always present, that has been efficiently used or misused in developing its agriculture. The most essential environmental factors, such as relief, climate and soil will be evaluated separately. Chapter I sets forth such material on topography or relief as is necessary for the interpretation of present conditions and future possibilities. Climate will be similarly developed in Chapter II and soils in Chapter III. Mineral resources, native vegetation and wild animal life, all of small present importance, will be discussed in places where their effect on economic conditions is outstanding. The geographic factor of location will be treated only incidentally in Part I. Geologic conditions are mentioned briefly in order to interpret more clearly the effect of topography, drainage and soils on human activity. The purpose of the first part, in short, is to reveal the natural stage upon which this play of life will be unfolded.

Part II sets forth in one chapter the human factor. In Chapter IV the performers appear in historic sequence, passing quickly in review before us in order to show to what extent they brought about conditions as they exist today. Part III considers trade and transportation. In Chapter V markets and their location

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*This material on the Agricultural Industry of Southeastern Pennsylvania is being published in the *Bulletin of the Geographical Society of Philadelphia,* in a series of six successive articles, beginning with the issue of January, 1928.

are considered as related factors. It also indicates the means by which these markets or assembling places are reached.

In Part IV the economic agricultural conditions of the region are developed, with special emphasis on the relationship of cause and effect. Chapters VI, VII and VIII depict the agricultural life of Southeastern Pennsylvania with all its interpretations, in order that a summary may be made of the problems of the area and in order that the influences of geographic factors may be clearly shown operating in a clearly outlined area. This summary should help to point the way for future development of the agricultural resources, so that avenues of opportunity indicated may be followed. It should also help to pave the way for the solution of its marketing problems. Chapter IX includes the summary mentioned above.

Southeastern Pennsylvania in this study includes the territory within the borders of seven counties; namely, Adams, Bucks, Chester, Lancaster, Delaware, Montgomery and York. This constitutes practically a single geographic region, the Piedmont Plateau. (A small acreage in Adams, York and Lancaster counties is properly included in the Appalachian Mountains, while a narrow strip along the Delaware River in Bucks and Delaware counties belongs to the Atlantic Coastal Plain.) Intensive industrial development in many parts of the region complicates the consideration of response to environment. Moreover, a long period of settlement makes the problem somewhat involved. The old and the new appear side by side.

Intensive work was begun on this thesis in the summer of 1925. An appointment to the staff of the U. S. Census Bureau, Washington, D. C., made it possible for the author to examine records not open to the general public and never published. These were the township records of the 1924 agricultural census. During the same summer he had access to the files of the Department of Agriculture and the Library of Congress. A field survey of the region had been made previously. The winters of 1925 and 1926 and the summer of 1926 were spent in gathering additional material, doing further field work, studying and writing.

Proper acknowledgment of assistance rendered in the preparation of this thesis is quite impossible. Everyone approached, the farmer, the county agricultural agent, the small mill-owner, the creamery man, was accommodating, courteous and helpful. Espe-

cially important was the assistance and co-operation given me by Mr. W. A. Austin and his staff, of the U. S. Census Bureau. Acknowledgment is likewise due to Secretary Frank P. Willits, of the State Department of Agriculture, as well as to Dr. Joseph E. Willits, Professor F. E. Williams and others of my colleagues for their helpful suggestions.

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PART I

THE ENVIRONMENT

I. RELIEF

Diversity is the single word that best applies to the physical appearance of Southeastern Pennsylvania. Its land surface is largely a low dissected plateau, the Pennsylvania Piedmont, that becomes decidedly hilly on its Western border, the region of the South Mountains. Lowlands of limestone, shale, sandstone and coastal plain sediments further modify its surface. These physical variations allow the area to be clearly divided into geographic regions that need separate description in order that the physical nature of the region be clearly portrayed.

A. The Hilly or Rugged Areas

The *Trenton Prong, or Crystalline Upland.*—A belt of low, crystalline hills, is the most extensive hilly region in the whole area. This prong is a northern extension of the Piedmont of Maryland. It extends northeastward through the area (Fig. 1).

The prong is a complex of highly metamorphosed sedimentary and igneous materials; consequently one finds a variety of rocks making up the mass of the belt. Gneisses, schists, quartzites, quartz schists, crystalline limestone and marble are most prominent. The country is rolling, the hills are mainly low (400-600 feet elevation). They are slightly dome-shaped, with rounded summits. The streams have cut many tortuous valleys and shallow ravines from 100 to 200 feet below the upland surface. A few steep slopes are found, but these are not common. These declivities are due to winding streams undercutting[1] their valley sides, thus removing the blanket of loose waste and laying bare the rocks beneath.

[1] Tower, Walter, *Regional and Economic Geography of Pennsylvania*, Part I, "Physiography."

This region is an old, worn-down mountain belt, once base-leveled, later rejuvenated, and maturely redissected. It is a country of up and down hill. In Chester and Delaware counties the prong is extensive, well developed, and typical of the belt as a whole; thus a detailed description of it in the above two counties will bring out the most salient of its characteristics.

Crystalline Uplands of Chester and Delaware Counties.—Hills, usually abrupt, fringe both sides of Chester Valley. These are the hills of the valley facing escarpments of the uplands. They[2] vary in height from 100 to 200 feet above the valley floor, and in width from two miles north of West Chester to four miles south of Coatesville. Along the Chester Valley the hills are well marked, decidedly hilly in appearance and divided into sections by stream gaps.

Numerous streams and their many tributaries have left but little of the once fairly level upland surface, except along the narrow stream divides. The valleys, however, in the upper reaches of these tributaries, are quite open, presenting only a minimum amount of erosional and cultivation difficulties. Toward the mouths of the streams the difficulties increase. Tortuous valleys and ravines are bounded by steep and often rocky slopes that are crossed by high railway embankments and bridges. In places the country is a gentle, smoothly rolling area. It presents the appearance of hill and dale, well wooded and prosperous. The topography interferes but little with agricultural activity. These gently rolling areas of variable size grade into moderately rolling surroundings with broken and steeper areas along the principal streams. This is the nature of the country in the neighborhood of West Chester, Kennett Square and Oxford. In other places, such as Northern Chester County, resistant sandstones and trap dykes have produced a very irregular and rugged semi-mountain topography. Consequently, we find such elevations as Barren Hill, Welsh Mountains and Mt. Pleasant.[3]

As one travels west and south across Delaware County, the nature of the country changes slightly. It becomes somewhat more hilly and rolling. This condition is due to the increasing size of

[2] U. S. G. Survey, West Chester and Coatesville Quadrangles—Contour Sheets.

[3] U. S. G. Survey—Topographic Maps—Coatesville, Phoenixville and Honeybrook Quadrangles (Chester County).

the streams as you approach their mouths. Five large creeks that are tributary to the Delaware River are the main drainage avenues of this county. These five main streams have a gradual slope until they approach within three or four miles of the Delaware River. There, on the high ground, may be observed a rather abrupt fall in the general surface of the region. This water-shed or fall line is not noticeably abrupt in the beds of the streams that cross it, but the rapids indicate its presence. Here, also, on the escarpment overlooking the flat-lying coastal plain and its master stream, the Delaware, were located wonderful building sites. Before the industrialization of the coastal plain area, these sites were considered very fine on account of their healthfulness and the general view that was afforded. Swarthmore College has such a location. Above the fall zone the country is decidedly rough. Away from the hilly stream areas the surface is undulating, but the closeness of the stream valleys has allowed for but few flat-topped divides of any real extent.

The South Mountains (Fig. 1) make up the second rugged belt within the area, but they are not a relatively important feature of this region, for they occupy only small areas in western Adams, York, Lancaster and northern Bucks counties. They are the only real highlands found within the seven counties. They rise steeply from the surrounding valley plains and plateaus to a height of 500 to 1000 feet, and with here and there an exposed core of ancient volcanic rock and quartzite, they become true mountains, although their extreme height (2100 feet) is less than one-third the height of the Black Hills of Dakota. They consist of a labyrinth of coves, hills and spurs with great variations in width, altitude and shape, almost direct responses to variations in rock structure and erosion. From an agricultural point of view, they include the poorest farm lands of the whole area.

B. Triassic or Sandstone Lowlands

The Triassic belt (Fig. 1) occupies a broad section of this area. The lowland nature of this belt of sandstone and shale is due to the fact that it is a region of weak sedimentary rocks.[4]

[4] Darton, N. H.—Newark Group—Distribution in Southeastern Pennsylvania, Philadelphia. Folio No. 3, U. S. G. S., 1909.

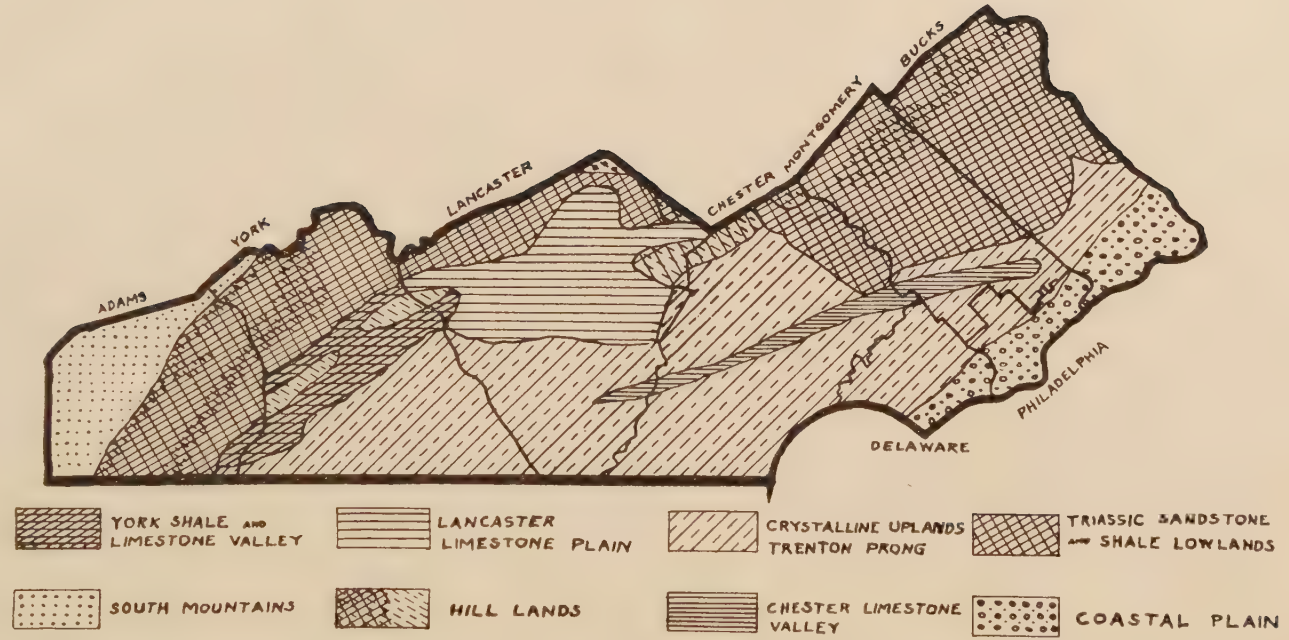

FIG. 1.—GEOGRAPHIC REGIONS OF SOUTHEASTERN PENNSYLVANIA

Erosional agents have worked more rapidly and more readily in these loosely consolidated rocks than in the firmer crystalline rocks that form its borders. In general, the country is low and gently rolling and the landscapes are pleasing in their simplicity. Streams have produced a slight roughening of the land surface. In the sandstone region the valleys are wide rather than deep, a condition that produces flooding during high-water periods. This flooding of the valley bottoms develops two disadvantageous conditions. The soil washes away in some places, while in others the areas are left covered with a layer of sand and gravel. Frequently the bridges were erected high above the streams and fastened by cables to prevent them from being carried away.

Here and there, scattered throughout the area, are trap ridges[5] of igneous intrusions and very resistant to erosion. Near Quakertown in Bucks County, is Haycock Mountain, a trap ridge of 960 feet elevation.[6] This mountain, together with Cemetery Ridge and Little Round Top at Gettysburg and other trap outcrops, produces some features in the Triassic belt of considerable importance. In contrast to the gentle, easily tilled slopes of most of the area, the trap slopes are rough and stony. Where the igneous material has pushed itself within close proximity or has broken through the surface as in the northern part of Bucks County, the upper layers of sandstone and shale have been metamorphosed slightly from the heat and pressure. These metamorphic rocks on disintegration fill the surface soil with fragments. This condition, together with the numerous igneous boulders of such areas, makes for rough, stony land, which is especially noticeable on the hilltops. In these hilly sections of the shale country and in the dyke lands, the stream valleys are cut deep, with banks high enough to prevent flood.

Limestone valleys, such as Durham (Bucks County) and Solebury (Bucks County) are further variations of the lowlands. Durham Valley is a prosperous agricultural valley surrounded by barren hills of gneiss and potsdam quartzite. The land surface is quite rolling, but in decided contrast to the rough border lands. From this valley came much of the brown hematite ore used in the historically famous blast furnaces of Durham.[7]

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[5] Bowman, Isaiah, *Forest Physiography*, p. 627.

[6] U. S. G. S.—Quakertown Quadrangle.

[7] A. M. Cummere, *Forges and Furnaces of Pennsylvania*, p. 45.

C. Limestone Plains and Valleys

Three limestone areas, the Chester or Plymouth Valley, the York Valley and the Lancaster Plain (Fig. 1), are found within the region.

Chester Valley.—A limestone region (Fig. 1) begins a short distance southeast of Willow Grove in Montgomery County. It probably connects with the great limestone outcrop of the Lancaster Plain, but the valley form is lost west of Quarryville. This valley has an average width of more than one mile, with a depth of 200 to 400 feet below the surrounding hills, and a total length of 55 miles.[8]

The region owes its valley form to the weak, non-resistant limestone rocks, as compared to the crystalline rocks of its surrounding upland walls. Limestone is easily eroded and weathered, but the hydro-mica schists of the South Valley hills and the quartzite, sandstone and gneiss of the northern hills, both a part of the Trenton Prong, have resisted erosion, and consequently form the valley sides with but little outstanding interruption throughout its entire length. The valley is a very conspicuous topographic feature. It has the appearance of a corridor that tempts you into fields beyond your vision. The floor of the valley is irregular. The irregularity is due to (1) irregularities in the composition of the limestone; (2) the location of such streams as the Wissahickon, Schuylkill and Valley Creek, that flow across this limestone belt transverse to the structure; and (3) the presence of outliers of the surrounding hills. No single stream utilizes the valley throughout its entire length. Rivulets descend the slopes and meander over its floor. The drainage is principally toward the southeast. The valley itself is separated into sections by other steep-sided, narrow valleys that are the product of transverse flowing streams.

Lancaster Plain.—Almost one-third of Lancaster County is a limestone plain,[9] of unsurpassed fertility. It forms a broad basin surrounding the city of Lancaster. Finger-like projections extend its area westward through York and into Adams County as the Codorous or York Valley, eastward into Chester County as the

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[8] Tower, Walter, Regional and Economic Geography of Pennsylvania: Part I, "Physiography."

[9] Frazer, Persifor, Jr., "The Geology of Lancaster County," 1877.

Conestoga Valley behind and the Downingtown or Chester Valley in front of the Welsh Mountains. A secondary basin approximately 16 miles long and 4 miles wide is found near the villages of Ephrata, Rome and Manheim (Fig. 2).

This limestone basin country is not flat, but gently rolling. Its surface topography and its fertile, highly cultivated fields make it similar in appearance to the Chester Valley. Because of its large

FIG. 2.—RELIEF MAP OF LANCASTER COUNTY, PENNSYLVANIA
Showing chief ridges of hills and great valleys and main stream systems.
(From a painting by H. Justin Roddy.)

size, however, it does not present a valley form, but resembles the plain in appearance. It has well-defined boundaries, however. To the north is a border of red sandstone, which is irregular and from 80 to 100 feet higher than the limestone plain. The older crystalline rocks form its southern boundary. This limestone county is the farming country, par excellence, of Southeastern Pennsylvania, for the surface is undulating to gently rolling, thus making the

surface topography almost ideal, not too flat for good surface drainage and rarely steep enough to produce erosional difficulties. It is so farmable that little waste land of any description is found.

York Valley.—The most easily recognized and sharply defined minor unit of the topography of York County is this narrow valley which occupies the central part of the county (Fig. 1). The valley has a gently sloping topography. Here and there are small, minor valleys and low, rounded hills and ridges. The width of this valley varies from three to five miles and it slopes toward the Susquehanna River. Nowhere is its elevation more than 550 feet[10] above sea-level or its depth 500 feet below the higher lands of York County. The valley is underlain by limestone and shale rocks,[11] that have easily been eroded—the former more than the latter. The limestone consequently occupies the lower land, while the low, rounded hills are underlain by shale. From York westward the valley is split by a conspicuous shale ridge, a spur of the Pigeon Hills. This produces a narrow secondary limestone valley. This valley lies parallel to the main valley and extends from near Emigsville to Farmers. The valley area is fertile and prosperous because the land is easily cultivated and transportation is made easy by favorable topography and well-kept highways.

Coastal Plain Area.—The Coastal Plain (Fig. 1), although including 25 per cent of Delaware County and 9 per cent of Bucks County, is not a part of the Piedmont. The fall line represents its inner border. From an elevation of 150-200 feet[12] at its junction with the uplands, the plain extends as a series of rather indistinct terraces and rolling slopes, practically to tide-level. Near the river are marsh lands and tidal flats that are inundated at regular intervals. In Delaware County the topography presents a flat aspect in contrast to the up-and-down hill country to the north. Along the stream valleys the land becomes more varied. Here erosion has exposed in places the crystalline base rocks. Gravels and clays are found, however, covering almost the entire area of the Delaware River townships. Recent alluvium covers Tinicum Township and also extends a short distance into neighboring town-

[10] U. S. G. S., Topographic Maps—York and Hanover.

[11] Veach, J. O., "Soil Survey of York County, U. S. D. A.," p. 7.

[12] U. S. G. S., Topographic Maps—Philadelphia Folio, Chester and Philadelphia Quadrangles.

ships. This alluvial mantle of the crystalline rocks is frequently thin, thickening, however, as the Delaware River is approached. This is indicated by well borings in the vicinity of Philadelphia.[13]

[13] Bascom, Florence, U. S. G. S.—Philadelphia Folio, West of the Delaware River.

II. CLIMATE

Climatic influences being important, it is necessary to analyze carefully the climate of the region which we have under consideration in order to show what adaptations have been made to climatic conditions and interpret intelligently the economic development of the area from an agricultural point of view. Since the main meteorological factors in determining climate are temperature, moisture, sunshine and wind, we shall consider these factors as applied to this area.

Temperatures of Southeastern Pennsylvania.—This region occupies an approximate half-way position on the climatic chart. Its average annual temperatures are slightly below 59° F., the average for the entire globe.[1] Lying between a region of equable temperatures, the ocean, and one of great variability, the north continental area, its climate partakes slightly of the nature of both. With its position on the leeward side of the Atlantic Ocean, the oceanic influence is less noticeable and the continental influence more noticeable than on the American Pacific Coast in the same latitude. Climatologists place the area in the East Coast Climatic Belt of the Temperate Zone. Its northern latitude also places it within the influence of the barometric depressions or storms which frequently pass from the west across the lake region and the New England States. These cyclones and anti-cyclones are accompanied by rapid changes in atmospheric conditions, thus producing variable weather all through the region.

The temperature of this region is not ordinarily subject to the extremes that visit the interior United States. Temperatures of 110° F. have been recorded in the Dakotas. In Montana the mid-winter temperatures often reach 25° F. below zero. The temperature also is moderate, as compared with other parts of the State. Lawrenceville in Central Pennsylvania reports a minimum temperature of 39° F. below zero. Claysville, Western Pennsylvania, has experienced a maximum temperature of 108° F. Tempera-

[1] Bartholomew, Physical Atlas, "Meteorology," 1899. (All statistical material obtained from U. S. Weather Bureau Records, unless otherwise noted.)

tures of 100° F. or higher are rarely recorded in this region, but the high humidity, relatively, sometimes makes the temperature conditions oppressive. During the hottest periods of summer the wind movement is generally light and affords but little relief. These periods, however, are generally broken up within a week or ten days by fresh, northeast winds. The winters are mild, there being an average of less than 100 days with a minimum temperature below the freezing point, while zero temperatures are seldom reached more than once or twice during the winter season. Between 1874 and 1924, inclusive, only 23 days with a temperature below zero were recorded in Philadelphia. The extremes of temperature are greater in the valleys than on the uplands. This condition is especially noticeable in the South Mountain district. Temperature conditions over an extended period are indicated in Tables 1 and 2.

Neither areal extent nor relief is sufficiently great to produce outstanding contrasts within the area. Slight variations are caused by (1) differences in elevation, (2) location in relation to the ocean and latitude, and (3) slight differences in the exposure of the instruments. Tables 1, 2 and 3 indicate the outstanding differences of temperature between representative places within the area and selected stations elsewhere in Pennsylvania.

Frost.—Of all portions of Pennsylvania this region is the most highly favored as regards the length of the frost-free season. Philadelphia, with a minimum growing season of 157 days and an average season of 207 days, is the most favored. The South Mountain farming districts are handicapped by a much shorter period free from frost. In the most important farming sections frosts are infrequent between May 1 and October 1. Farmers in most parts of the area can depend on an average growing season of approximately 180 days, varying from 160 days at Quakertown to 207 days in the vicinity of Philadelphia (see Table 4).

Temperature Changes.—Temperature conditions over a long period of time are not noticeably changing in this region. The annual mean temperatures possess remarkable uniformity. The forty-seven years of Pennsylvania Hospital records indicate a 53.7° mean. Weather Bureau records for forty years following record a 54.8° mean. Harsh and mild winter weather prevails. Summers may be intensely hot or cool, but the total amount of heat received

TABLE 1.—AVERAGE NUMBER OF DAYS WITH TEMPERATURE 90° F. OR ABOVE

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Year of Record
Gettysburg	0	0	0	0	2	5	10	6	2	0	0	0	25	20
Reading	0	0	0	0	1	4	8	4	2	0	0	0	19	21
Philadelphia	0	0	0	0	0	3	6	3	1	0	0	0	13	37
State College	0	0	0	0	0	1	2	2	1	0	0	0	6	25
Pittsburgh	0	0	0	0	1	3	7	4	2	0	0	0	17	46
Erie	0	0	0	0	0	0	1	1	0	0	0	0	2	48

TABLE 2.—AVERAGE NUMBER OF DAYS WITH TEMPERATURE 32° F. OR BELOW

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Year of Record
Gettysburg	27	25	20	7	0	0	0	0	0	4	16	26	125	20
State College	28	22	22	9	1	0	0	0	0	4	16	27	129	25
Erie	27	25	23	8	0	0	0	0	0	1	11	23	118	48
Pittsburgh	24	22	15	5	0	0	0	0	0	1	10	21	98	46
Philadelphia	22	20	13	2	0	0	0	0	0	0	6	18	81	40
Reading	26	25	18	5	0	0	0	0	0	2	12	25	113	21
West Chester	25	24	16	5	0	0	0	0	0	1	11	24	106	20

TABLE 3.—TEMPERATURE—ELEVATION—DISTANCE FROM NEAREST BODY OF WATER

Station	Average Mean Winter Dec.-Feb.	Average Mean Summer June-Aug.	Average Mean Spring Mar.-May	Average Mean Fall Sept.-Nov.	Annual Mean Temperature	Mean Maximum Annual	Mean Minimum Annual	Elevation	Distance Miles
Philadelphia	33.86	74.1	51.6	56.9	54.1	62.1	46.4	157	50
Coastal Plain	Jan.	July	March	Sept.		July	Jan.		
	32.7	76.5	40.6	68.1		84.5	26.0		
Coatesville	31.1	71.4	50.6	54.4	51.9	63.4	42.0	380	85
Chester	Feb.	July	March	Sept.		July	Feb.		
Valley	29.9	74.7	39.4	66.1		86.4	20.2		
West Chester	31.3	71.9	49.6	54.2	51.8	61.3	43.6	450	75
Trenton	Jan.	July	March	Sept.		July	Feb.		
Prong	30.2	74.3	38.3	65.3		84.7	21.4		
Lancaster	30.9	72.1	49.9	53.6	51.6	63.8	40.0	255	110
Limestone	Jan.	July	March	Sept.		July	Feb.		
Plain	29.6	73.4	38.0	64.5		86.4	19.4		
York	30.5	72.3	50.6	53.9	51.8	63.0	41.3	400	125
Limestone	Jan.	July	March	Sept.		July	Jan.		
Valley	29.3	74.4	39.4	65.6		86.6	20.4		
Quakertown	28.8	69.3	48.1	52.3	49.6	61.5	39.9	496	65
Triassic	Jan.	July	March	Sept.		July	Feb.		
Lowlands	27.0	72.5	36.3	63.6		86.0	18.5		
Gettysburg	30.3	71.8	50.3	52.8	51.3	63.1	41.4	600	135
Triassic	Jan.	July	March	Sept.		July	Feb.		
Lowlands	29.0	74.0	39.2	65.0		86.9	19.7		
Erie	28.2	68.9	45.0	52.6	48.7	55.9	41.6	714	0
	Feb.	July	March	Sept.		July	Feb.		
	25.8	71.2	33.6	63.8		78.3	18.4		

in Southeastern Pennsylvania over an extended period has not changed.

Precipitation in Southeastern Pennsylvania.—After temperature, the next most important climatic factor is the moisture, either as water vapor or as water in the form of rain, snow and the like. This region has a great advantage as to rainfall, the average precipitation of 46 inches being almost ideal for agriculture. One has to be aware that only 25 per cent of the land surface of the globe receives over 40 inches annually to realize to what degree this region is favored.

TABLE 4.—FROST DATES

Town	Average Date of Last Kill	Latest Date	Average Date of First Killing	Earliest Date	Average Growing Season	Minimum Growing Season	Elevation Ft.	Years of Record
Gettysburg	April 21	May 14	Oct. 19	Sept. 22	181	131	600	18
Lancaster	27	27	6	11	162	107	255	13
State College	29	29	6	11	160	105	1217	36
York	23	17	8	11	168	149	400	16
Erie	20	17	2	9	196	145	714	37
Pittsburg	21	29	22	25	184	119	842	48
Coatesville	20	12	17	22	180	133	380	27
Philadelphia	7	29	31	3	207	157	156	48
Quakertown	30	29	7	15	160	109	496	24
Reading	15	5	15	1	183	149	325	25
Kennett Sq.	19	17	22	2	186	138	275	25

Considerable variation in the mean annual rainfall of different stations is noticed (Table 5). The variation is probably due to soil, position and altitude. Slight variation may be accounted for on the basis of exposure of instruments and the degree of efficiency of the recorder.

The rainfall is usually well distributed throughout the year. Summer appears to be the rainy period, with the dry period coming during the fall months.

The normal rainfall is ample for the growing of the staples of the area. The annual rainfall, if well distributed, would be sufficient even in the driest year, but occasionally there exists a marked seasonal deficiency or excess, either of which may be detrimental, particularly the former. During certain seasons of the year this scarcity of rain is comparatively unimportant, but during

TABLE 5.—PRECIPITATION: MONTHLY, ANNUAL AND AVERAGE AMOUNTS

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual	Years
Chester Valley														
Coatesville	3.97	4.10	4.36	3.63	4.03	4.04	5.02	4.43	3.90	3.52	3.19	4.22	48.41	30
Heaviest	7.25	10.22	7.66	7.52	11.72	7.18	12.93	9.84	9.12	6.78	8.60	9.24	68.94	
Lightest	1.36	1.03	0.49	1.38	1.19	1.46	1.16	0.46	0.71	0.48	1.01	0.59	32.70	
Snowfall	9.80	12.70	9.30	2.50	0.00	0.00	0.00	0.00	0.00	Trace	2.30	7.90	44.50	
Triassic Lowlands														
Doylestown	3.66	3.86	4.07	3.98	4.01	4.00	4.86	5.53	3.95	3.98	3.30	4.02	49.22	20
Heaviest	6.78	7.51	9.71	7.93	1.41	10.29	11.87	14.00	9.69	8.68	10.05	7.96	67.08	
Lightest	1.03	1.17	0.89	1.65	0.56	1.18	0.16	1.32	0.34	0.17	0.53	1.07	31.87	
Snowfall														
Coastal Plain														
Philadelphia	3.27	3.31	3.48	3.16	3.33	3.31	4.24	4.74	3.33	2.94	2.99	3.33	41.43	48
Heaviest	6.74	6.87	9.10	9.76	9.46	8.04	10.30	12.10	12.09	6.66	7.31	7.35	55.28	
Lightest	1.49	0.84	0.38	0.61	0.54	0.74	0.75	0.46	0.20	0.30	0.67	0.83	30.21	
Snowfall	6.70	7.50	4.50	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.80	4.80	25.50	
Trenton Prong														
West Chester	3.83	3.90	4.07	3.78	4.45	4.19	4.83	4.68	3.92	3.74	3.63	4.09	49.12	20
Heaviest	7.32	7.29	8.33	8.80	13.82	9.32	0.73	12.35	12.33	8.66	9.91	8.59	73.00	
Lightest	0.81	0.47	0.52	1.10	0.83	0.96	0.00	0.55	0.29	0.36	0.74	0.59	33.03	
Snowfall	8.70	9.10	6.80	1.50	0.00	0.00	14.58	0.00	0.00	0.00	1.70	6.90	34.70	
Limestone Plain														
Lancaster	3.25	2.68	3.45	3.54	3.28	3.99	3.92	4.08	3.34	3.08	2.42	3.41	40.39	13
Heaviest	4.79	5.66	6.61	6.54	7.04	7.98	9.17	9.62	8.43	7.34	9.02	6.08	52.25	
Lightest	1.57	0.59	0.50	1.20	0.74	1.08	1.18	1.13	0.28	0.28	0.72	0.60	28.63	
Snowfall	8.20	7.60	9.50	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.60	9.70	42.80	
Triassic Lowlands														
Gettysburg	3.14	2.81	3.16	3.60	3.97	3.90	3.62	4.07	3.37	3.20	2.67	3.33	40.84	20
Heaviest	7.22	7.11	8.00	6.09	10.95	8.58	9.08	12.99	8.71	7.57	8.48	6.08	52.25	
Lightest	0.63	0.98	0.48	0.62	1.10	0.26	0.85	0.45	0.72	0.55	0.38	0.60	28.63	
Snowfall	12.00	9.80	7.80	1.90	0.00	0.00	0.00	0.00	0.00	0.00	1.60	9.70	42.80	

periods of critical crop growth it becomes a question of serious moment.

Dry Spells—Dry spells are most frequent after the harvest season in the autumn months of September, October and November. Droughts, however, as they occur in more westerly States, are unknown, and where the land is in really good tilth, crops usually weather even the driest spells. Land not in good tilth and land of uncertain types on exposed slopes suffer during the dry period. Dry spells that do a great deal of damage occur on an average of only two or three times in a decade. Total crop failures are even then usually prevented by timely showers.

Wet Spells—Rain or snow storms do not usually exceed two or three days in duration. There are periods, however, of much more extended rainy or cloudy weather.

Between May 21, 1897, and September 6, 1910, the Philadelphia office has recorded 66 storms with excessive precipitation. Excessive rains in summer are usually accompanied by thunderstorms. These occur most frequently in the month of July. June and August are close rivals. Between 1885 and 1910, July has averaged seven thunderstorms (not all, however, carrying excessive precipitation), June 5, and August 5½. Although the thunderstorms in July are most numerous, the August storms produce greater rainfall per storm. In 50 years (1874-1924) there were 10 storms in July with a precipitation of one inch or over in an hour. The average was 1.285. In the same period August recorded 25 such storms with an average precipitation of 1.5796. The greatest precipitation in one hour also occurred in August when 5.43 inches of rain fell on August 3, 1898.

This probably indicates a greater severity of the August thunderstorms. June in the same period produced only seven such thunderstorms, with the greatest precipitation 1.90 inches; September recorded eleven with a maximum precipitation of 2.43 inches per hour. Eight storms were divided as follows:

Month	Number	Maximum Amount of Precipitation per Hour
February	2	1.11
April	1	1.08
May	4	1.38
October	1	1.53

Summer rains are less than half the duration of those of the winter. Floods are most common in February and March, when the ground is frozen or has been saturated by previous rains. Flood damage is not extensive, however, except along the meadow lands and low river terraces. Ice freshets during the winter and spring months and heavy rains in the summer will, at times, increase the Schuylkill River at Manayunk above ordinary low-water mark as much as 27 feet (1869) and 21 feet (1894). Floods of this height will cause property damage in river towns, destruction of bridges and flooding of river bottoms. No floods such as are experienced along the Ohio and Mississippi rivers occur in Southeastern Pennsylvania. Narrow river valleys, with little level land and limited drainage basins adjoining, make floods harmless when compared with the great floods of the Middle West.

Snowfall—Precipitation is largely in the form of rain. The mean annual snowfall for nine scattered stations throughout the region is 35.4 inches. This is a comparatively light snowfall. During a thirty-year period, 44.5 inches of snow has fallen in Coatesville and 25.5 inches at Philadelphia. Granpian (Central Pennsylvania) reports 72.7 inches average per year, and Montrose (Western Pennsylvania) reports 71.6 inches. A large part of the winter precipitation is rain, or rain and snow mixed. Occasional heavy snows occur. The greatest depth of snow on the ground in Philadelphia was 26 inches in 1899. In contrast, the year 1901 had only 3 inches on the ground at any one time. The total snowfall of that year was only 11.4 inches. The least snowfall was during the year 1889, when a total of 5.7 inches fell in Philadelphia, and the greatest in 1907 (44.6 inches). Only infrequently does the snow remain for an extended period as a blanket covering the ground.

Hail and Wind Storms—Hail storms and severe wind storms of tornadic nature are not common in this region, and where they do appear are greatly restricted in extent. They have been known, however, to do very serious local damage. Between the years 1911 and 1916, inclusive, the Philadelphia Weather Bureau reported 6 days with hail, one each in February, May, June, July, August and November.

The records for the years 1911 to 1924, inclusive, show an average of 78 days per year with a wind velocity of 25 miles or over, but only a 3½-day yearly average with wind velocity over

40 miles. January heads the list, followed by March and August. The heavy winds are mostly of the winter and spring varieties and are the result of the greater development of the pressure areas during the winter months. The August winds are more the result of unequal local heating and usually accompany thunderstorms. A velocity of 75 miles per hour was experienced only once in 39 years, and a velocity of sixty miles an hour or over was recorded five times. Velocities of over 40 miles per hour in the same period occurred on 114 different occasions.[2]

Humidity and Fogs—Humidity, the invisible moisture of the atmosphere, has important functions to perform. It tempers the heat and cold. Extremes of temperatures do not prevail where humidity is present in large amounts. It is the great source of supply of precipitation. It is also at times a source of personal discomfort. High relative humidity, with a high temperature, causes the air to feel muggy and man to lose energy through the prevention of rapid evaporation. High humidity plus a low temperature produces a raw atmospheric condition. A moderate temperature becomes oppressively hot when the humidity approaches or exceeds 80 per cent. Temperatures of 15° or 20° above zero with an 80 per cent humidity, a condition fairly common in this region, cause much suffering. Temperatures, however, of 20° below zero with a humidity of 25 to 30 per cent are described as comfortable and exhilarating in the northwest.

Humidity is rather high at frequent intervals in Southeastern Pennsylvania. During May, 1925, the relative humidity at 8 A. M. reached 80 per cent on ten days out of the thirty-one. On the 24th, at 8 P. M., the relative humidity was 97 per cent, and on the 29th it stood at 92 per cent. The mean for the month was 73 per cent at 8 A. M. The normal monthly means are indicated as follows:

Month	8 A.M.	8 P.M.	Month	8 A.M.	8 P.M.
January	76	70	July	72	66
February	74	68	August	75	68
March	73	65	September	78	70
April	68	60	October	75	67
May	71	65	November	75	67
June	72	66	December	74	67

[2] A gale is technically defined as a wind velocity of 40 miles or over per hour.

Mean annual relative humidity conditions of approximately 70 per cent divided as indicated above, make for many raw winter days and hot, oppressive summer days during the year in this neighborhood. August with a 75 per cent average at 8 A. M. and a 68 per cent at 8 P. M. is our most disagreeable month, while on many a January day the damp cold penetrates through the warmest of garments even with the temperature above zero.

Fogs of some nature are fairly common in this region during the months of November, December and January. October, 1899, experienced eight days with fog, the greatest number of foggy days of any monthly period (1885-1910). The mean monthly (1871-1910) fog record is as follows:

January	1.30	May	0.1	September	0.8
February	0.80	June	0.2	October	0.9
March	0.70	July	0.2	November	1.20
April	0.30	August	0.4	December	1.20

Dense fogs, however, are not of long duration, rarely continuing through any considerable portion of the day period. At times, however, they are a serious menace to shipping along the Delaware and to highway transportation throughout the entire region. Fogs do not interfere with plant growth, for there is usually an abundance of sunshine during the growing season, all through the region. The amount varies considerably in different months, but in all months the average is 59 per cent of the possible amount, divided among the months as follows:

January	51	May	59	September	64
February	59	June	61	October	62
March	54	July	64	November	54
April	58	August	63	December	53

Summary—The climate of this region may be considered as a modified marine type, due to its proximity to the Atlantic Ocean. New England climate is represented only in the South Mountain section of this area. Throughout the largest and most important part of the region under discussion, conditions approach the climatic mildness of the States of New Jersey, Delaware and Maryland. Altitude and oceanic influences are responsible for this section of the State having milder temperature conditions than prevail elsewhere in Pennsylvania. The Erie Plain, on account of

its close proximity to the lake, has a mean temperature and a growing season of greater similarity to this region than to any other part of the State.

Southeastern Pennsylvania, from a climatic point of view, is the most favored part of the State for the development of a diversified agriculture. Its rainfall of over 45 inches, well distributed throughout the year, is well above the average for the State. The growing season is the longest, the winters are the mildest, and the danger of droughts less than in any other part of Pennsylvania. The summer heat and humidity are excellent for the rapid development of plant life. Few storms of tornadic violence prevail, and the crop damage is very small. Oppressive heat due to the high humidity makes many days disagreeable to man and beast in summer, and the presence of many raw days in winter, on account of the same high humidity, modifies the mildness of the winter period. All things considered, however, the area possesses an exceptionally advantageous climate for human activity.

III. SOILS[1]

This factor of soil, perhaps more than any other, lends distinction and interest to this region. No less than fourteen important soil series obtain here, as well as many lesser ones. The extent of this diversity is illustrated in the case of the sedimentary type. There are three kinds of sedimentary rocks: limestone, sandstone and shale. In turn there are two varieties of limestone, pure and impure; two varieties of sandstone, hard and soft; two varieties of shale, that which is slightly metamorphosed and that which is extensively so. Other rock types show a similar variation, which gives rise to a similarity in their related soils.

Underlying rock structure and relief have determined the nature of the soil in the typical physiographic provinces which we have under consideration, namely, the limestone plains, the crystalline uplands and the sandstone lowlands. In contrast the coastal plains soils are alluvial. In order to emphasize the extent to which these areas are distinctive, I shall consider somewhat in detail the character of the soils which prevail in each.

Soils of the Limestone Plains

Three different series of limestone soils are found here: the Hagerstown, Conestoga and Decatur. These soils make up the largest part of the plain of Lancaster County, the Chester Valley of Lancaster, Chester and Montgomery counties, York County Valley, and small scattered areas such as Durham and Solebury valleys, Bucks County, Cumberland Valley, York County and the Adams County limestone regions. Of this group the Hagerstown is the most important and extensive.

Hagerstown Limestone—This is a residual soil derived through the partial dissolution of massive blue limestones.

Its importance and value are due to many factors. It is usually a valley or plain soil, and although its surface is by no means level, but rolling, the topography is such that cultivation is comparatively easy. The gently rolling to undulating surface floor, the low ridges, rounded hills, and sink holes in certain areas, which

[1] Statistics, unless otherwise stated, are from Bulletins and Soil Surveys of the U.S.D.A.—Bureau of Soils.

are due to slight differences in permeability of the underlying rock, furnish an adequate surface run-off that makes artificial drainage unnecessary. The slopes, moreover, are very gentle. The rainwater finds a deep and mellow bed into which it may percolate, and it finds outlet through the numerous crevices, sink holes and caverns. Consequently erosion is not a serious matter, and one finds but few mechanical obstructions in soil cultivation. The land is easily tilled. It does not puddle easily. It is not impoverished by chert or flint fragments that are sometimes found in areas of impure limestones. The surface soil is friable, soft and mellow, and the virgin soil is well charged with organic matter. This soil does not dry out rapidly, because it contains sufficient clay to make it retentive of moisture. The soil has depth, the surface soil ranging from six to fourteen inches, and the subsoil to a depth of ten feet. It is so deep and so heavy in texture as to require the use of large draft horses, either in double team or the four-horse hitch common in Pennsylvania, or tractors. The limestone ledges, which are common, furnish supplies of easily accessible material for roads and for fertilizer.

Conestoga Limestone—This soil is derived from metamorphosed limestone. It usually occupies a more steeply rolling country than do the Hagerstown soils. It has good natural drainage but lacks the underground drainage of the Hagerstown soils. On the steeper slopes considerable damage is done frequently by sheet wash and gullying, and for this reason it requires more attention than does the clay of the Hagerstown soils. It is also likely to dry out more quickly, thus making scientific cultivation necessary in order to reduce evaporation losses. Work can, however, begin earlier in the spring. Nowhere, except in a few areas near the Susquehanna River, is the land too precipitous for easy tillage. The following mechanical analysis will give the outstanding differences between the Hagerstown and Conestoga soils.

Table 6—Mechanical Analysis (Percentage) of Limestone Loam Surface Soils of Montgomery County[2]

	Fine Gravel	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	Clay
Hagerstown	.7	2.9	2.4	6.1	6.7	57.6	23.1
Conestoga	.8	2.2	2.0	18.7	17.9	40.1	18.2

[2] Soil Survey of Montgomery County, 1905, U. S. Bureau of Soils, U. S. D. A.

Decatur Clay Loam—The distinguishing feature of this limestone is its red color. The parent rock is a crystalline limestone, much of which is in the nature of marble. It is freer from carbonaceous and other impurities than the Hagerstown limestone, and the red color of the soil is attributed to this difference. In practically all other aspects it differs but little from the Hagerstown soils. The topography, level or gently rolling land, is the same. The same crops are grown. The agricultural practices are about the same, and today the two have an almost equal agricultural value. The color differences, however, indicate chemical or physical differences which, when clearly understood, will doubtless give rise to a more specialized adaptation of certain crops within this area.

It is clear, then, that the limestone soils are exceedingly high in productive capacity. The Hagerstown loam is the most valuable and most extensive, but practically all of the limestone soils are in demand and usable, there being little waste land. Little opportunity therefore remains for the extension of agriculture on these limestones except through the possible improvement of agricultural practices. This is possible through the better adaptation of soils to crops, the better use of fertilizer, and the more intensive cultivation of the land. Although differences of soil and topography occur throughout the region, the unfavorable characteristic of steep slopes, presence of rocks and stones, and heaviness of texture, is only one of relative degree and would not be considered as unfavorable if comparisons were made with other soils. More corn, wheat, tobacco and general crops are produced to the acre on limestone, and more corn and grass fed cattle raised, than on any other soil. The limestone soils cover approximately ten and eight-tenths per cent of the land area of the region and equal approximately eighteen thousand acres (see Fig. 3). Table 8 gives the name and actual and relative extent of each limestone soil series in the counties where it is most extensive.

Soils of the Hilly or Rugged Areas

The crystalline upland soils are the most extensive (Fig. 3). These soils may be derived from the trap rock, diorite, schists, gabbro or granite of igneous intrusives, or from metamorphosed sedimentary rocks that, lying close at hand, have been changed in

character by the heat from the igneous intrusions. On account of these distinctive features of geology the soil of these crystalline uplands is so varied as to include thirteen soil series, with many main ones present in as many as five different types. The five soil types that prevail are the loam, occupying the level tops of ridges, gentle slopes and plain-like areas; silt loam, occupying practically the same topographical position but differing slightly from the loam in mineral composition; sandy loam, closely associated with the loam, occupying hilltops and slope alike. This type is free from stone but wears out rapidly with continuous cropping. Its high sand content is an advantage, allowing it to warm up rapidly and relieving it from wet weather clods which would retard its growth, prevent early maturity of crops, and render tillage difficult; slate loam which covers the rolling and hilly areas. The rock beds which underlie this type are at times nearly horizontal, thereby preventing water percolation downward. The result is a lateral seepage which makes soggy adjoining areas at times of excessive rains; stony loam, found on the steeper slopes and being so high in percentage of rock content as to be of little value.

Its favorable surface condition makes the loam type most desired. It rarely puddles or crusts, and retains moisture fairly well. When carefully managed it is a good general-purpose, farming soil. Almost all of this type is under cultivation, and of the original forests only a few woodlots remain.

Unfortunately the steep hill slope types, i.e., slate loam, stony loam, and rough, stony land, are very extensively developed, which fact lowers the average value of the land. The steepness of much of the land and its stony character interfere with easy cultivation. Stone fragments and rocks must be removed. Erosion is a serious problem, and unless great pains are taken, wash and gullying ruin the farm. The soil and subsoil, moreover, contain a high percentage of rock fragments which are so numerous as to constitute from 25 to 60 per cent of the soil mass in many places and hinder cultivation wherever found. All these hillside types are deficient in lime and likely therefore to sour with constant usage unless heavily limed. Crop yields on this less valuable soil are occasionally equal to those of the loam, but the expense of production is always much greater on account of the difficulties of tillage, the waste of fertilizer, through washing, and the high percentage of waste land. A large amount of this rough and stony land still remains in scrub

and second growth timber. General farming can be carried on only in the more favored sections, and then only with difficulty. Fruit can be grown in certain parts, but marketing problems beset the farmer. The coves are distant from market and served only by poor and difficult country roads. The successful farmer finds it necessary to practice contour ploughing to prevent soil waste in some degree. He must also divide the land into plots, so that an entire hillside will not be in corn at the same time. He must also make sure that grass or some other crop of the rotation lies above or below the corn. Great differences in crop yields are noticed in such regions. These are due in part to soil productivity, but they are to a larger extent the result of management. In the mountains, farming methods are less intensive and methodical. In most cases the loam is entirely under cultivation, while the stony loam and kindred types are mostly forested. Good loam situated within easy hauling distance of a railway or shipping point brings as high as one hundred and seventy-five dollars an acre. Prices for other types range downward from this to as low as fifteen dollars for the poorer, stony land.

These soils have serious disadvantages not generally associated with the limestone group. In the first place they are not naturally fertile, being deficient in lime, phosphoric acid, and organic matter, with the result that they require generous amounts of fertilizer in order to be continuously productive. Moreover, lime is more difficult to obtain on account of distance from kilns and poor transportation facilities in the rougher areas of the back country. These soils, too, are associated with rougher topography, with all its associated problems of gullying, soil wash, and drainage. This condition necessitates contour plowing and large areas of timber and pasture land. The high stone content of these soils makes the preparation of land for crops more difficult, and lowers the value of what land the farmer can control. Inefficient methods of farming are more disastrous here than on the limestone lands, and the percentage of waste land is much higher.

Soils of the Triassic Lowlands

The Triassic materials are the red and gray sandstones and shales. These red rock materials produce the Penn soils, and the gray rocks the Lansdale soils. These soils occupy practically

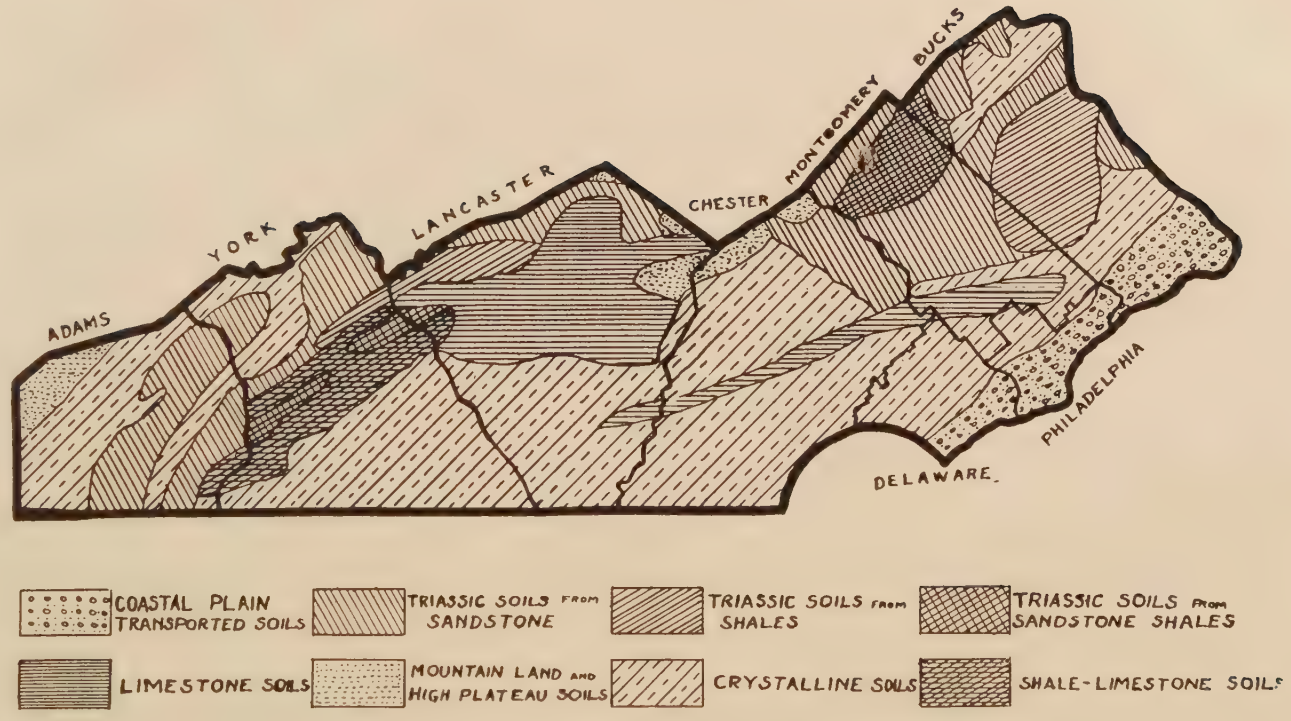

FIG. 3.—SOIL MAP OF SOUTHEASTERN PENNSYLVANIA

the entire area of the Triassic basins of Bucks, northern Montgomery, southern Berks, northern Lancaster, and Adams counties (Fig. 3). The soils cover 27.2 per cent of the land area of the region (Table 8).

The topography associated with these soils is usually level and rolling. Broad-ridged plains or undulating valleys are typical of the region. Often the area is roughened by protruding ledges of trap rock that produce stony areas, somewhat elevated above the floor of the basins, and by stream erosion. Many of the larger streams have carved out considerable valleys. These, together with the smaller tributary streams, produce considerable variation in level.

Adequate drainage is a more pressing problem than erosion. The parent rocks usually lie in a more or less horizontal position, preventing free run-off. The unpermeability of the shale beds underlying the shale loam soils also prevents the downward percolation of water to any great depth. Consequently, large areas of the heavier soils need artificial drainage before they can be utilized to their fullest extent. If the season is wet, considerable areas are wet and clammy, moisture being unable to escape except in a lateral direction. On the lower portions of the slopes the land frequently becomes very wet from the lateral drainage of the higher areas. This land, locally called "spouty land," returns in wet weather a greatly diminished yield. Many farmers, in cultivating the land, leave water furrows at intervals of from forty to eighty feet in order to complete the drainage. Tile under the most level tracts could be used to advantage. Rarely, however, would artificial drainage be needed over the entire farm. Its application in the flat lands and in the shale regions would increase the crop-producing capacity, render possible early plowing and tillage, and improve the texture of the subsoil. In the vicinity of uplifted areas the shale frequently has vertical fractures, which provide for the removal of excess water, but frequently the drainage is thus made too excessive, with the consequent drying out of the soil during the dry periods.

The lime and organic content of these soils is low. The loam and silt soils are, however, friable, comparatively easily worked, and free from stones. Wherever drainage is adequate, fertilization attended to, and thorough plowing and tillage considered, these soils can be made very productive. In fact, the loam and silt loam

rank high as agricultural soils, while most of the other types suffer from drought, being loose, stony and low in organic matter. Little waste land is found in the areas covered by the silt and loam soils. A few woodlots, mostly white oak and hickory, still exist, but most of the land is utilized for general farm crops.

A slight difference exists between the Penn silt loam and the Lansdale silt loam of Montgomery County, as the following analysis attests.

TABLE 7.—MECHANICAL ANALYSIS OF TRIASSIC SILT LOAM SOILS OF MONTGOMERY COUNTY[8]

Description	Fine Gravel	Coarse	Medium	Fine	Very Fine	Silt	Clay
Lansdale Soil	.2	1.6	1.1	4.5	5.1	68.2	19.1
Penn Soil	1.5	4.6	2.3	4.6	8.2	57.4	21.0
Lansdale Subsoil	.4	1.0	.9	3.5	5.4	65.7	23.0
Penn Subsoil	1.6	5.4	2.6	4.8	5.7	50.5	29.3

Little difference in value can be detected between the best crystalline soils and the most valuable Triassic. Any difference in value would be largely dependent upon location, and care in handling and cultivation. Both types are on the average inferior to the limestone soils. The Triassic soils lack lime and other matter in sufficient amounts, thus making the question of fertilization a vital one. Drainage is the most serious problem of the Triassic soils, a factor which does not worry the farmer in the limestone or crystalline areas. Trap ledges reduce the average value of the land by increasing the number of land areas difficult to cultivate. On the whole, however, the amount of land areas so reduced in value is less than that in the crystalline area. In most cases the Triassic soils can be made very productive. Table 8 locates the chief Triassic soil areas in the Piedmont.

TRANSPORTED SOILS

Coastal Plain Soils.—These soils are mostly of the Sassafras series, and occupy the narrow coastal plain that is found along the Delaware River in Delaware, Philadelphia and Bucks counties (Fig 3). They are nowhere higher than two hundred feet above the sea, and they lie in terraces which to the eye appear level but in

[8] Soil Survey of Montgomery County, 1905, U.S.D.A., Bureau of Soils.

reality slope sufficiently to give drainage to the higher areas. Near the creeks the slope is steeper on account of erosion. The soil has no relation to the rocks that it covers. It consists largely of material that has been derived from the crystalline and sedimentary areas to the west and brought into the region by the Delaware River and its tributaries. The soil, especially the sandy loam and sands, is well adapted to truck crops, but proper adaptation of soil to crops has not yet been made in spite of its proximity to a great city market. Farming in the region is giving way to business, residential and manufacturing plants. Market gardens are increasing, dairying is developing, but general farming still prevails over much of the area. Swampy places near the Delaware need drainage in order to make them useful.

River Bottom and Terrace Soils.—Alluvial deposits are found along practically all the larger streams of the region. In no instances, however, have broad flood plains been developed. In the case of small streams the problem of annual overflow is a serious one, while along the major streams the so-called first bottoms are frequently endangered by periodic inundation.

Along the Susquehanna River, terraces are commonly found. They are made of material transported from the various soils of the drainage basin of the Susquehanna River system. The material varies from water-worn gravels to fine earth. These terraces are of sufficient extent to be of real agricultural value and are all practically under cultivation. No topographic difficulties are encountered, the land being level or gently rolling and easily worked. Many of the terraces are above the ordinary flood stage of the river. The lowest terraces are usually poorly drained and subject to floods. The soils, however, are deep, and under favorable conditions are very productive. Good land of this group brings from seventy-five to three hundred dollars an acre, the average being one hundred and fifty dollars to the acre for general purposes.

Conclusion.—Soil analysis of the region under discussion has made possible conclusions. In the first place, soil, topography and geologic formations are very closely interrelated. With only two exceptions, the bottom alluvial transported soils of the immediate stream valleys and the coastal plain soils, the soils are closely related to the underground structure and rock content. They are almost entirely residual soils, and their characteristics in regard to

texture, drainage, erosion, value, etc., depend upon the nature of the parent rock and the topographical position.

These Piedmont soil types differ in productiveness and value to the farmer. This is not due solely to soil content, but also to relief, two conditions that are practically inseparable. The climate being practically the same over the entire area and suitable in all sections for the prevailing type of agriculture, the only influence exerted by it would be in the way of soil erosion and leaching. All things considered, the steeper the hillside the greater the soil erosion, a condition that would to a large extent prevail, no matter what the type of soil. However, as certain soils are typical hillside soils, they lose more of their valuable plant food by erosion than do the soils of the more level areas; consequently, in that respect and because of their location and thinness they are less valuable for agricultural purposes.

TABLE 8.—SOILS OF SOUTHEASTERN PENNSYLVANIA AND THEIR DIVISION AMONG THE SEVERAL COUNTIES[4]

County	Lime Stone Acreage Percentage	Crystalline Acreage Percentage	Triassic Acreage Percentage	Transported Acreage Percentage
Adams	17,472 (5.1)	162,752 (47.6)	158,016 (46.2)	3,648 (1.1)
Bucks (Estimated)	8,960 (2.2)	125,600 (32.3)	219,560 (56.5)	35,000 (9.0)
Chester	19,456 (4.0)	407,488 (83.9)	37,444 (7.7)	21,830 (4.4)
Delaware		88,800 (75.0)		38,600 (25.0)
Lancaster	222,784 (37.0)	258,944 (42.9)	79,944 (12.6)	45,568 (7.5)
Montgomery	13,184 (4.2)	142,976 (44.9)	155,712 (49.2)	5,568 (1.7)
York	24,896 (4.2)	407,232 (70.5)	124,544 (21.5)	21,248 (3.8)
Total	306,752 (10.8)	1,593,792 (56.0)	775,220 (27.2)	171,462 (6.0)

Usually the sedimentary rock soils have the poorest drainage because of the topography associated with them and the horizontal nature of the strata. On the average that is true here, but the limestone soil drainage is mostly adequate because of the nature of the parent rock which on weathering produces sink holes and provides underground drainage.

All things considered, the limestone is the soil par excellence in the area. Its importance and superior value are due to (1) the lime content, the sweetener of the soil family; (2) the favorable

[4] Statistics from Soil Surveys, U. S. Bureau of Soils.

topography associated with it; (3) the good drainage that prevails; (4) the texture which allows for ease of cultivation; (5) the high humus content; (6) the presence of adequate fertilizer when needed; and (7) its ability to retain moisture, which makes it an adequate dry-weather soil. This limestone soil, together with extensive areas of crystalline and Triassic soils of the highest order, gives a fairly high average value to the soil of the entire region. Fig. 3 indicates the location of the different soil groups in the regions under discussion.

A final conclusion might be drawn; namely, that the soil and topography are only minor handicaps to the development of the area, and that these handicaps are largely overcome by a very advantageous climate. If crop adjustment be carefully made, the area can become a fairly prosperous agricultural region on the average, with certain areas taking their place among the most highly developed agricultural regions of the country.

PART II
THE PEOPLE

IV. COLONIAL SETTLERS

Into Southeastern Pennsylvania, a region of richness and promise, came the pioneers at the beginning of the seventeenth century to work out under the directing influence of geographic conditions their "strange, eventful histories." The peoples who were to use the natural tools of this region and shape its destiny were of distinct nationalities, with distinctive racial temperaments produced by the natural and economic conditions that prevailed in the lands of their origin. It is a matter of great interest to see how their choice of location as well as their reaction to the new environment was determined by racial traits, and to observe to what extent these characteristics have influenced the development of this region.

Swedes.—It was characteristic of the Swede that he should content himself with the occupation of the alluvial lands along the Delaware River without venturing into the wilderness. His first interest lay in trade with the Indians, since the provisions for agriculture were miserable. Governor Printz reported in 1647 that there were in all only twenty-five head of cattle.[1] These were allowed to roam at will through the primeval forest, which was free at that time of underbrush.[2] Thomas Budd said of the region on each side of the Delaware, "In the woods grows plentifully a coarse sort of grass that makes the animals fat in summer, but the marsh hay used in winter is lacking in nutriment."[3] The Swedes, however, planted fruit trees[4] and soon had flourishing gardens, so that with the advent of the Quakers, who were next to arrive, they

[1] Myers, A. C., *Narratives of Early Pennsylvania, West New Jersey and Delaware, 1630-1707,* p. 124. New York: 1912.

[2] Watson, J. F., *Annals of Philadelphia and Pennsylvania* (1844), Vol. I, p. 80.

[3] Budd, Thos., *Good Order Established in Pennsylvania and New Jersey, 1685,* p. 34.

[4] Myers, A. C., *Narratives,* pp. 96-120.

grew prosperous from the sale of surplus stores of seed and livestock.[5] They made wine from sassafras, corn or persimmons, and lived like lords, indulging in four meals a day on shad and quail from river and field, fat bucks brought in by Indians for trade, and the produce from their own prolific orchards. The soil was light and sandy or gravelly. Since rye yielded better on such soil than wheat, and since dark bread was preferred by Swedish colonists, rye became their major crop.[6]

From 1638, the time of their arrival, until they gradually intermingled with other peoples who followed them, the Swedes occupied the shore of the river as far north as the present site of Philadelphia. They were the first raisers of tobacco. In 1644 Governor Printz, of New Sweden, reported exports of 4991 pounds of tobacco harvested in his colony. In 1647 the export had increased to 6920 pounds.[7]

The influx of greater numbers of other peoples, and the occupancy of a relatively unimportant and restricted area, make the story of the Swedes a comparatively short one. All that remains of their early adventures is a small number of their descendants living among us, and a few such picturesque reminders as the old block house on Naaman's Creek and the Old Swedes' Church in Philadelphia.

English.—The location of the English Quakers in Chester and Delaware counties was a matter of propinquity. Arriving at the Swedish settlement at Chester in 1602, they followed the course of the creeks inland and took up land that was nearest at hand. They were for the most part well-to-do people, able to buy the land. Only the goad of unceasing persecution could have induced them to leave their prosperous homes in Sussex. They were, too, people of varied occupations, so they were not limited as to the sort of ways in which they might make a living, as were, for instance, the Germans, who came later. They were, moreover, a cultivated people and consequently somewhat gregarious; for this reason they preferred to locate near the original settlements at Chester and Philadelphia. It is, perhaps, true, too, that the "all-roundness" of the typical Englishman made these early settlers keen to make the most

[5] Kalm Per, *Travels in North America, 1748-59.* Translated by J. R. Forster, 3 vols. Vol. I, pp. 1, 141 (1770 edition).

[6] Paschall, Thos., Letter, 1685. In Myers' *Narratives,* pp. 245-54.

[7] Myers, A. C., *Narratives,* pp. 96-120.

of the varied resources of these crystalline uplands of Chester and Delaware counties. The exceptional beauty of this region, moreover, must have had its appeal to these early English, who, as their buildings testify, were esthetically sensitive. It was these characteristics, as well as their industry, discretion and prudence that were responsible for the development of that stretch of crystalline upland, reaching from Darby Creek westward to the Octoraro, as well as the southern part of Bucks County. They laid the foundation for a good breed of horses. William Penn, in 1682, brought over three brood mares and in 1699 he imported the magnificent colt, Tamerlane, a product of the best English strain.[8] The English also introduced the famous English grasses.[9] The native grasses, although tall and plentiful, were not good feed for animals.

The English pioneers did not fail to take advantage of the numerous waterfalls that existed along the fall line. Here they erected grist mills such as the one still standing at Locksley, Delaware County. Settlers in Bucks County similarly took advantage of the falls of the Delaware near what is now Trenton and of the falls of the Neshaminy in Middletown Township. Until 1707, all grists in Bucks County were taken to one or the other of these places.[10]

They used to advantage also such topographic features as the great spring streams in Solebury Township. A grist mill was built here in 1707. These mills were necessarily infrequent, and farmers were obliged to go either in cart or on horseback for miles with their grain. Numerous smaller springs which are characteristic of the crystalline upland, as the name of Springfield Township in Delaware County indicates, were a very great asset to the settlers. Another noteworthy resource which the ingenious English did not overlook was the iron ore lying in small pockets throughout the region. Before the middle of the eighteenth century, ironworks had been established at various places.[11]

Welsh.—It is even more evident in the case of the Welsh than of the English that racial characteristics determined in part the

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[8] Eggleston, Edw., "History in Colonial Times," *Century Magazine,* Vol. V, pp. 27, 445.

[9] Myers, *Narratives,* pp. 264, 269.

[10] *Forges and Furnaces of the Province of Pennsylvania,* 1914, p. 43. An excellent account.

[11] Day, Sherman, *Pennsylvania Historical Collections* (1843), p. 150.

choice of the land they occupied, and the manner in which they developed it. The tract of forty thousand acres which Penn had surveyed for them west of the Schuylkill more nearly resembled their own country than did any other land that could be found near Philadelphia. It is likely that the woodsman's instinct of the first Welsh explorers who went out to select the tract, led them to follow that ridge of high land which is the watershed between the western side of the Schuylkill and the lower Delaware.

The country becomes more and more diversified as one goes westward along this ridge, more rolling and hilly, with longer vistas, and with cooler, drier air. The famous limestone valley, known to the Welsh as Duffrin Mawr and to us as Chester Valley, lies along its southern border, and extensive views may be had of it from the upland. In those days it was a magnificent domain, covered with enormous oaks, sycamores and poplars.[12]

As the population grew, the Welsh spread out into Newtown, Goshen and Uwchlan townships, occupying parts of Chester Valley and passing over into Montgomery County, which was named by them. Since then they have mingled with other peoples, but such names as Merion, Radnor and Uwchlan, and such charming spots as St. David's Church in the valley of Radnor, remain to remind us of the early prestige of these worthy people in this favored place.

One of their early members, writing in 1708, testifies to the alertness with which these people adapted themselves to this upland area in the Piedmont and the extent to which they furthered its development. He says, "This tract is very populous, and the people are very industrious, by which means this country is better cleared than any other part of the country. The inhabitants have many fine plantations of corn and breed an abundance of cattle, insomuch that they are looked upon to be as thriving and wealthy as any in the province; and this must always be said of the Welsh that wherever they come 'tis not of their fault if they do not live and live well, too, for they seldom spare for labor, which seldom fails of success."[13]

Germans.—The Germans who constituted the major portion of the immigrants to the limestone valleys of Lancaster County were inhabitants of the Palatinate in Germany, which during the Middle

[12] Day, Sherman, *Pennsylvania Historical Collections* (1843), p. 150.
[13] Day, Sherman, *Pennsylvania Historical Collections,* p. 483.

Ages had been one of the most powerful of German states. It was a region of great fertility, the country along the Rhine and Neckar rivers being known as the Garden Spot of Germany. At the time of the emigration the ancestors of these men had cultivated the soil in many districts for thirty generations, and had acquired reputations as husbandmen second to none in Europe.

Unlike the well-to-do English and Welsh Quakers, the German settlers were very poor. The persecutions which they had suffered at the hands of both church and state had been harrowing in the extreme, and their passage at sea had, in most cases, been so fraught with hardship and danger that only the strongest had endured it.[14] Many of them were redemptioners and had no money with which to buy land. Arriving several decades later than the English and Welsh (1713), they found that land in Chester, Delaware, Bucks and Montgomery counties which lay nearest to Philadelphia already occupied, and being unable to purchase land there, they pushed on into the wilderness of Lancaster County, in search of land worth only the labor of clearing it. They ignored the course of the streams leading inland, where fortunes were to be made in fur trade, for they were farmers, unskilled in other pursuits.

On arriving in the limestone regions of Lancaster County, they observed the heavy stands of hardwood, which to their practiced eyes gave evidence of rich soil.[15] Here, wherever the topography was favorable, they began to establish permanent homes. With characteristic thoroughness and foresight they cut down the timber, grubbed out the stumps, and burned out the underbrush. In this way they made their fields as suitable for farming the second year as they would have been twenty years later had they merely girded the trees and allowed them to rot, as was the general custom throughout the early settlements.[16] The soil of their homeland had been rich, yielding generously to their patient husbandry. In the new homesteads there was a fertility comparable to that of the old, and physical surroundings in which they must exercise just that particular skill for which they were already famous. Here were virgin stretches of limestone soil waiting only that painstaking care and thoroughness which they were peculiarly able to give it. So

[14] Fisher, Sydney G., *The Making of Pennsylvania*, p. 102.

[15] *Ibid.*, p. 110.

[16] Rush, Benjamin, *Accounts of the German Inhabitants of Pennsylvania* (1789).

it was that German farmers gained possession of most of the limestone soil in Lancaster County and brought about its thriving development.

It was not alone the fruitfulness of the soil but the wide variety of its resources as well that made this region adaptable to the needs of the colonists. From the quarries they procured stone for the foundations of both house and barn. Trees felled in the clearing, and seasoned, provided the superstructure. The beautiful old homes and commodious barns of stone that one may still see in this region were not "builded in a day." They were the painstaking work of generations. The cleared fields offered an abundance and variety of grain, with flax for the spinning wheel. The township of Hempfield received that name because it was literally a hemp field. Deer and buffalo, which ranged the countryside, afforded meat as well as shoe and harness leather. In 1754[17] there was a manufactory in Lancaster of saddles and pack saddles. Like the earlier settlers, they depended on the small game of the forest and wild fowl for variety in their fare and for pelts and feathers. The wild fruit of the clearing was supplemented in time by the produce from orchards. Primeval maples supplied their sugar. Fences, farm implements, such as rakes and pitchforks, sleds, carts and bridges were made entirely of wood. Springs[18] furnished water for the household and the stock, and many of the little, descending streams were dammed to provide water power for grist or saw mills. In these various ways the German settlers managed as did those of other nations. The details are set forth to show how, remote as they were from port, and impoverished, they were able to live as well as the more favored English, and to overtake the eastward counties in development on account of the sheer abundance of natural wealth of this limestone plain.

It was inevitable that, in a region of such fatness, production should begin to exceed the needs of the home and that a thriving trade should spring up. As soon as there was wheat, fruit, garden produce and whisky in such abundance that it might be sold, a means of transportation became necessary. This need brought forth the great Conestoga wagons, the so-called ships of inland commerce. Wagon manufacture required iron, and Nature again provided the raw material for a new industry. The thickly wooded

[17] *Ibid.*

[18] SHELTON, F. H., *Springs and Spas of Old Time Philadelphians*, p. 200.

hillsides furnished charcoal, and pockets of iron ore were opened up in various places throughout the county.

It is interesting to note, however, that it was not the Palatinate farmers who developed this industry, but certain Welsh and Cornishmen who had wandered westward from the English settlements.[19] Old mines in Caernarvon Township still bear the name of David Jones, a Welsh ironmaster, who came to this place from Radnor as early as 1730. It was Peter Grubb, a Cornishman, who discovered and developed the famous Cornwall mine in what was then Lancaster County.[20] It was another Welshman, John Jenkins, who, in company with other countrymen, emigrated to Caernarvon Township and operated the picturesque Windsor Forges of pleasant memory. There was only one name of German origin prominent among the early ironmasters of Lancaster County, that of Henry Steigel, master of the Elizabeth Forge in 1757, and he was in no wise a true representative of his countrymen. Around the forges of which these are typical was centered in those days one of the most picturesque and individual phases of rural life in early Pennsylvania.

Scotch-Irish.—During Colonial history the Scotch-Irish were the frontiersmen, occupying the westernmost position along the line of settlements from New Hampshire to Virginia. In Pennsylvania, accordingly, they passed over those productive areas settled by the Welsh and English, as well as the rich limestone plains that the Germans a few years later were to enter with so much avidity, and pressed on to the hilly country beyond where the numerous streams of the rough hillsides and the clear mountain air reminded them of home. Such Scotch-Irish as did occupy scattered sections of the more fertile areas of the Piedmont, were greatly incensed at the influx of the Germans who followed them. Great hostility prevailed until the proprietors urged the Germans to confine their holdings to the southern and more fertile sections of the counties, and recommended that the Scotch-Irish move westward. Their motive is clear: the Germans were more adapted to the peaceful, fertile farms, while the Scotch-Irish, brave, pugnacious and daring, were at their best on the frontier. Their presence on the outposts would constitute the best defence the Colonies

[19] *Forges and Furnaces in the Province of Pennsylvania*, p. 67.
[20] *Ibid.*, p. 83.

could have against the Indians. Oddly enough, the Scotch-Irish, unmindful of the wealth to be gained from the soil they were leaving, accepted the suggestion eagerly, for yonder in the hills was the lure of adventure and strife, and the priceless privilege of liberty and independence.

An interesting illustration of the disregard of the Scotch-Irish for fertile land and their marked preference for the hilly land, no matter what its value, may be found in the early records of Chester and Lancaster counties. The limestone land, so the Scotch-Irish thought, was too liable to frost and too heavily wooded, so they seated themselves in 1763 along the northern tier of townships of these two counties in a stretch of crystalline upland known as the "Chestnut Glade."[21] The Germans, who were not intimidated either by the difficulty of clearing, the want of water or the liability of frost, purchased their previous improvements and proceeded to develop a veritable garden.

It will be recalled that this stretch of crystalline soils which the Scotch-Irish took up is of the type peculiarly in need of painstaking care and patience in cultivation, as well as constant fertilization. In the light of this geographic factor, the subsequent history of the "Chestnut Glade" is very interesting. The Scotch-Irish, having exhausted the virgin strength of the soil, and forever on the qui vive as to what might be going on around the next curve, responded to the lure of the passes in the Alleghanies, beyond which new lands were being opened in 1768, and vacated their holdings.[22] Once more the Germans to the south, heavy, complacent, but shrewd in detecting values, and quick to take advantage of the improvements the Scotch-Irish had made on the land, bought the whole strip of territory. Then, bringing to bear the technique which their ancestors had developed on the banks of the Rhine, they restored the land to productiveness, and their descendants occupy it still.

It was characteristic, again, of the Scotch-Irish that they should have chosen to occupy the York Barrens. There is probably no less productive soil in the Piedmont. Large numbers marched to this region and without so much as "by your leave" to the proprietors began to establish homes there in 1734.[23] Survey-

[21] Day, Sherman, *Pennsylvania Historical Collections*, p. 394.
[22] Fisher, S. G., *The Making of Pennsylvania*, p. 163.
[23] Ballaugh, in *American History Association Reports*, 1897, p. 112.

ors, whom the proprietors sent thither preparatory to evicting the settlers, were resisted, their instruments broken, and they were compelled to retire. It was only after they had proved that they could hold it by force that the settlers consented to pay for it. Perhaps it was sheer perversity, then, as well as love for this heath-like spot, that made them remain there and develop the barren land into a fairly successful agricultural community.

Adams County in the early days was the frontier and the Scotch-Irish flocked there in great numbers. It is significant that the first settlement was not on the choicest soil, but in the hills near the sources of Marsh Creek.[24] Practically every township bears an Irish name and descendants of these early settlers are still in the majority.

In following years the Scotch-Irish did not confine themselves to such areas as we have described. Indeed, they spread out and gained political control of the State. It is, however, with the development of hilly, infertile upland that they are characteristically associated.

It becomes apparent, then, that this region was blessed not only in the richness and variety of its resources, but in being settled by people who were peculiarly able to make the most of the opportunities afforded. These two factors determined very largely the development of the region during approximately the first century of its occupancy.

Present Population

The present population is increasing at the rate of approximately 100,000 new inhabitants every ten years. Two counties adjacent to Philadelphia reported the most rapid increase. Between 1900 and 1920 Delaware County increased its population 82 per cent and Montgomery County recorded a 43 per cent increase. Adams County, the most remote and having the roughest topography, increased its population in twenty years (1900-1920) by only 87 people and in seventy years by only 8602. Its population density of 65.5 places it forty-first among the sixty-seven counties of the State. All other counties showed increases ranging from 24 per cent in York County to 9 per cent in Lancaster County. Population statistics are here shown.

[24] Day, Sherman, *Pennsylvania Historical Collections*, p. 56.

TABLE 9.—POPULATION DATA OF SOUTHEASTERN PENNSYLVANIA BY COUNTIES (1920)

Items	Adams	Bucks	Chester	Delaware	Lancaster	Montgomery	York
Population	34,583	82,476	115,120	173,084	173,797	199,310	144,521
Density	65.5	135.7	148.2	935.6	184.7	411.8	160.0
Increase, 1900-20	00.25	14.0	20.0	82.0	9.0	43.0	24.0
Urban	4,439	25,290	46,227	92,691	77,432	84,206	62,694
Increase, 1900-10	15.3	45.5	56.7	29.0	19.9	33.6	32.8
1910-20	10.1	32.1	9.2	66.6	20.1	25.6	21.0
Rural	30,144	57,186	68,893	80,393	96,365	115,104	81,827
Increase or Decrease, 1900-10	—2.3	—1.1	—2.6	20.6	—2.7	15.4	9.3
1910-20	—0.5	—0.4	30.0	29.1	—6.0	12.3	—3.3
Rurban[25]	7,186	11,951	9,095	21,806	12,711	11,526	21,674
Farm[26]	15,932	26,068	26,084	5,589	47,713	21,177	37,663

[25] Inhabitants of incorporated places below 2,500.
[26] Inhabitants of unincorporated places.

TABLE 10.—RACES AND NATIONALITIES OF THE PIEDMONT COUNTIES (1920)

Races or Country of Nativity	Adams	Bucks	Chester	Delaware	Lancaster	Montgomery	York
Native white, native parents	33,282	58,610	78,574	92,315	154,863	127,002	134,350
Native white, foreign and mixed parentage	843	13,661	15,459	38,969	12,449	39,244	6,090
Negroes	295	1,810	11,386	15,717	2,166	8,326	2,092
Orientals	0	25	22	131	9	69	14
Foreign-born white	163	8,370	9,679	25,952	4,310	24,669	1,975
Austria	3	453	774	726	104	1,014	138
Canada	13	135	93	495	74	386	46
Czechoslovakia	1	102	452	164	37	293	11
England	16	676	699	3,327	234	2,300	201
France	9	116	52	272	94	331	33
Germany	57	1,457	485	1,303	1,994	2,512	702
Greece	12	82	97	409	136	112	46
Hungary	0	602	951	349	85	992	44
Ireland	18	809	1,385	4,707	205	5,448	109
Italy	3	2,264	2,196	4,435	376	6,480	187
Jugo Slavia	0	45	77	377	70	100	41
Lithuania	0	28	18	439	4	81	5
Poland	0	367	1,028	3,474	93	1,851	64
Russia	22	514	666	2,687	355	933	138
Scotland	0	220	147	935	99	639	43
Sweden	1	78	46	226	28	243	27
Wales	0	20	33	220	33	89	36
Others	8	302	480	1,407	289	825	104
Total Population	34,583	82,476	115,120	173,084	173,797	199,310	144,521

TABLE 11.—RACES AND NATIONALITIES OF THE PIEDMONT CITIES

Races—Country	Chester	Coatesville	Lancaster	York	Bristol	Columbia	Norristown	Phoenixville	Pottstown	West Chester
Native white native parents	25,627	8,626	42,126	41,552	4,178	8,589	19,411	5,201	13,570	7,678
Native white-foreign and mixed parents	13,908	2,256	7,387	3,343	3,318	1,534	7,093	3,166	2,170	1,448
Negroes	7,125	1,881	915	1,416	317	335	1,507	181	450	1,831
Orientals	78	1	8	8	7	1	11	3	2	7
Foreign-born white	11,292	1,751	2,714	1,193	2,453	377	4,297	1,933	1,239	753
Austria	426	193	43	80	12	4	84	312	201	9
Canada	158	10	37	27	27	5	51	4	18	9
Czechoslovakia	42	68	14	9	2	2	13	271	122	0
England	984	78	136	119	120	19	369	62	47	57
France	70	3	65	25	9	4	26	3	5	8
Germany	222	35	1,299	431	52	207	346	110	176	59
Greece	291	19	118	38	50	11	37	9	30	24
Hungary	41	280	32	13	7	5	18	316	220	3
Ireland	1,276	97	87	37	210	25	765	141	33	217
Italy	1,986	370	272	131	1,761	21	2,086	192	160	241
Jugo Slavia	282	5	7	3	2	1	17	15	2	12
Lithuania	391	9	3	0	0	0	8	0	1	1
Poland	2,523	285	42	43	13	11	49	421	115	6
Rumania	29	7	7	1	3	0	8	5	1	0
Russia	1,707	183	308	112	65	9	219	48	58	65
Scotland	276	32	38	30	36	29	67	5	15	11
Sweden	74	4	11	14	9	2	33	7	4	3
Switzerland	18	9	87	23	3	6	13	4	3	7
Syria	10	38	5	2	0	0	1	0	0	2
Wales	71	7	7	9	4	12	18	6	6	0
Others	415	19	96	36	68	4	69	2	22	19
Total Population	58,030	14,515	53,150	47,512	10,273	10,836	32,319	10,484	17,431	11,717

Population statistics appear to indicate that the rural population exceeded the urban population by 136,933 out of a total population of 922,891 people. A better population division would have put at least 95,949 inhabitants in the non-rural or better the rurban group; this, then, would have produced a modified rural population of 433,963, as compared to a town group of 488,928. Many of the remaining ruralities have no direct interest in agriculture. Tinicum Township (Delaware County) contained 2,500 rural population and 14 acres of farm land. Lancaster Township (Lancaster County) had 2,647 rural inhabitants and only 3,255 acres of farm land. The farm land of Lower Darby Township (Delaware County) consisted of 748 acres, but it had a population outside of borough limits of 3,077 (1920). In 1925 the farm population amounted to 180,226 people of all ages.

In this area the native whites made up 87 per cent of the total population, the foreign-born approximately 8.5 per cent and the negro slightly more than 4.5 per cent. Of the foreign-born, the English, Germans, Italians, Irish and Poles were the most numerous (Table 10). It is clear from a study of Tables 10 and 11 that the foreign-born population, as is population in general, was most densely concentrated in the Philadelphia metropolitan industrial district.

Today the white population of this region is becoming well mixed racially. This is the result largely of the extensive industrial development of the region, for the mixture is most noticeable in the large industrial cities. The rural and suburban population is more likely to be of older stock with greater purity of blood strain. This older stock remain firmly established in their old surroundings. They resent changes. Firms a century old are still in business. New firms, new products and new methods have difficulty in gaining recognition. The fact that most of the mushroom growers find their market almost entirely in New York City is significant in this connection. These groups are the dominant ones, and the influence exerted by the English and Welsh Quakers, the Pennsylvania Dutch, the Scotch-Irish, and the other older groups is still very noticeable in spite of a decreasing percentage in numbers.

PART III

TRADE AND TRANSPORTATION

V. POPULATION AND MARKETS

It is an interesting study[1] to discover how, with the increase of population, the development of the great hinterland of the Atlantic seaboard, and the progress in mechanical invention, Southeastern Pennsylvania proved to be strategically located. We shall see that its position was (1) within reach of a large consuming population with high purchasing ability, (2) athwart the pathway of great land routes, (3) accessible to foreign markets.

This region lies in the zone of greatest population concentration in the United States. New York, Pennsylvania, New Jersey, Delaware and Maryland, all lying within a comparatively short distance, have a combined population of 23,933,808. More people are located in these States than live in Spain. Over one-half as many persons make their homes here as do in the entire republic of France. Argentine has less than half as many inhabitants, and the Japanese Empire holds less than four times as many. The producers of this region have quick access to more people than occupy all the States of the United States between the Rocky Mountains and the Pacific Coast.

The concentration of this population is very marked. The 23,933,808 people occupy an area of 117,251 square miles. The population of Spain is spread over 192,000 square miles. The French population is concentrated to approximately the same degree. Of this group Japan only is more densely populated.

Rural and Urban.—Population statistics, however, are no absolute indicators of capacity for consumption. From an agricultural point of view, dense population is significant only when it is predominantly urban. It is no doubt true that thousands of so-called ruralites, people that live in small towns of less than twenty-five

[1] U. S. Census, 1920. All statistics from U. S. Census Reports unless otherwise indicated.

hundred inhabitants, are consumers of agricultural produce. Farmers, also, buy and sell among themselves. These two groups, however, furnish only a scarcely appreciable market. It is the urban population, which supplies itself with only a modicum of produce from its small garden plots, that furnishes the better market.

It is the urban character of the population, therefore, that is significant. In the five States adjacent to and surrounding this area, over seventeen and a half million people, according to the United States census, are classified as urban. The farm population numbers over two million. Within the region including Philadelphia, 2,333,951 people dwell in urban communities and 577,367 in the country or in boroughs of less than twenty-five hundred population. So it is that both within its borders and in the surrounding territory the urban dwellers provide a ready market for agricultural produce.

This situation is made more clear by comparing the occupational groups of the Third Federal Reserve District. The commercial survey of this district shows that of all persons employed, only 8 per cent are engaged in agriculture. The remaining occupational groups have percentages as follows: Manufacturing 43, transportation 8, trade 10, clerical work 9, domestic and personal service 8, mining 7, professional service 5 and public service 2. In the country at large 26 per cent are engaged in agriculture. This occupational division indicates that a larger percentage of the population employed in this district than in the United States can be classified as non-agricultural producers. This group constitutes the bulk of the consuming public. The farmers of the United States in comparison have not an equally large potential market, for only 74 per cent are urban as compared to 92 per cent in this district.

Purchasing Power.—Sheer numbers, however, are not an accurate gauge of high capacity for consumption. The four hundred million Chinese maintain low standards because of their limited individual purchasing power. Much light is thrown on the purchasing power of the people here by the recent commercial survey[3] of the Third Federal Reserve District. On page ten of this survey the statement is made that the Third Federal Reserve District

[3] Dewhurst, J. F., *Commercial Survey of the Philadelphia Marketing Area,* U. S. Department of Commerce, Domestic Series, No. 1, 1925, p. 99, Table VI.

accounts for 5.2 per cent of the total wholesale trade and 6.6 per cent of the total retail trade of the United States.

Fairly good indicators of buying power are wealth and income statistics, since a man's power to buy determines his capacity to consume. The survey mentioned above tells us further that the total bank deposits per capita of the people of Southeastern Pennsylvania average $292.24, the saving deposits $213, the building and loan association assets $43.33, and the estimated true value of real estate $1,351. This is higher wealth and income per-capita average than that of the rural and mountain areas of Pennsylvania. It is slightly lower than the average for the entire Third Federal Reserve District. In this region the number of income tax returns[3] amounts to 33 1/3 per cent of the State returns. This percentage is increased to 48.98 when the individual returns of over five thousand dollars are alone considered. If we allow the wealth and income of the Third Federal Reserve District to be the criterion by which we judge the buying power of these consumers, or if we confine ourselves to the average buying power of these counties alone, the per-capita returns compare favorably with those of the United States, which has a $342 total per-capita bank deposit, a $145 per-capita saving deposit, and a $32 building and loan per-capita asset.[4]

The Curtis Publishing Company's statistical study, *Sales Quota,* corroborates this testimony further by including within its group of most desirable counties of the United States all the counties in this area. Their analysis of income-tax returns, bank deposits, production statistics, automobile registration, retail outlets, population, and extent of circulation of Curtis publications has brought them to the conclusion that the potential marketing possibilities are very favorable in this region.

Trade.—The surplus from the farms of this region goes largely to wholesalers; their needs are supplied more generally through retailers. The volume of wholesale trade in this area amounted to $67,938,000 in 1923.[5] This was greater than the total wholesale trade of the twenty-one counties of the rural and mountain areas of Pennsylvania and the six counties of the bituminous

[3] *Sales Quota,* Curtis Publishing Co., Advertising Department, 1925, pp. 273-81.

[4] *Survey of Philadelphia Marketing Area,* p. 100.

[5] DEWHURST, J. FREDERICK, *Survey of the Philadelphia Marketing Area,* p. 123.

coal and oil region combined. The retail trade, somewhat larger, amounted to $210,002,000 in 1923[5] or $215 per capita. The rural and mountain areas of Pennsylvania spend only $197 per capita, the anthracite mining district $183, and the bituminous coal and oil area $222.

Public Markets.—Little business is done by direct sale from producer to consumer except in the public markets. Thirty-two[6] of these, or 23½ per cent of the State markets of a similar nature are within these counties. They are divided among the counties as follows: Lancaster County 13, Montgomery 7, York 6, Chester 3, Delaware 2, and Adams 1. Markets in adjacent counties number 64. Thirty-three of these are in Philadelphia. There are nine open or curb markets, and twenty-three market houses.

These markets are a survival of that early time before railway transportation enlarged the marketing area, and while yet the surplus was not so large but what it could be disposed of locally. This means of trade has become a community habit, which, it is hoped, will continue, since it is both useful and picturesque. It is a means of trade, however, that is not likely to enlarge, for it is not particularly profitable. These markets are not usually municipally owned, but private enterprises with income derived from space rentals.

Marketing Information.—The Pennsylvania Department of Agriculture, realizing the need of the farmer to know the condition of the market and the prevailing market prices, established in 1922 a system of marketing information. Since that time reporters have been established in Allentown, Easton, Erie, Harrisburg, Lancaster, Pittsburgh, Scranton, Wilkes-Barre and York. The duty of these men is to report to the local papers valuable information relative to prevailing prices and conditions of the market for the products of the region in which they are located. The United States Bureau of Markets, also, provides farmers with information regarding the broader National market conditions. The large Pennsylvania dailies, too, carry market news. These assembled facts from State and National sources, forwarded constantly to small markets and shipping points throughout the region, greatly facilitate the disposal of agricultural produce.

Co-operative Organizations.—These associations are growing throughout the area. They are outstanding in the tobacco region

[6] Pennsylvania Department of Agriculture.

of Lancaster County, the Adams County fruit area, the West Chester mushroom district, and the market milk region near Philadelphia. The nature of the activities of these associations can be illustrated by a report from the Mushroom Growers Association. It announced a meeting to be held at West Chester, June 26, 1926, with representatives from New York commission men, to discuss the problem of marketing the supply. The importance of these associations to the producer needs no further elaboration here.

In Southeastern Pennsylvania such organizations to the number of 32[8] have been developed. Of these, two are co-operative associations under the State law[9] of 1919, which provides for the organization of such associations without capital stock or profit. These co-operative enterprises are fairly well distributed,[10] Lancaster County having ten, York nine, Bucks eight, Chester four, Montgomery and Adams one each. Susquehanna County is the only one in the State that exceeds Lancaster in this respect; it has thirteen. This co-operative marketing situation, in comparison with other selected areas, is shown in Table 12.

TABLE 12.—CO-OPERATIVE MARKETING[11] IN SOUTHEASTERN PENNSYLVANIA (1924)

(A comparison is made with other selected sections of the United States)

County, State or Region	Value of Farm Products Handled	
	Products Sold	Supplies Purchased
Adams County	$14,419	$22,077
Bucks County	44,075	121,171
Chester County	86,901	72,092
Delaware County	.....	10,409
Lancaster County	60,019	48,194
Montgomery County	102,937	22,986
York County	90,793	172,493
Southeastern Pennsylvania	399,144	475,422
Pennsylvania	10,019,901	2,492,431
California	87,245,308	4,754,744
Los Angeles County (Cal.)	14,146,470	1,124,820
Southeastern Wisconsin	1,237,657	235,653
DeKalb County (Ill.)	895,365	62,383

[7] *Philadelphia Inquirer,* Special, June 25, 1926.

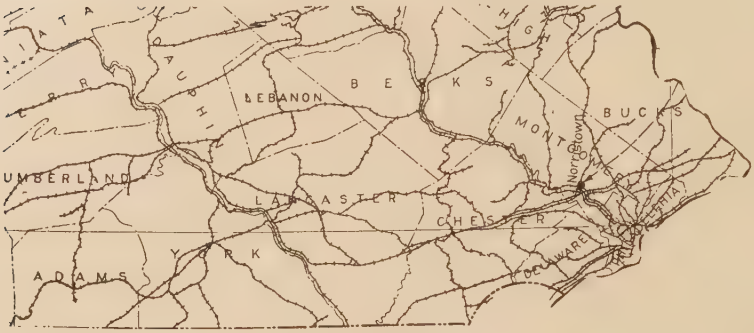
[8] WATTS, R. L., *Rural Pennsylvania,* p. 205.

[9] Pennsylvania Department of Agriculture, General Bulletin 314.

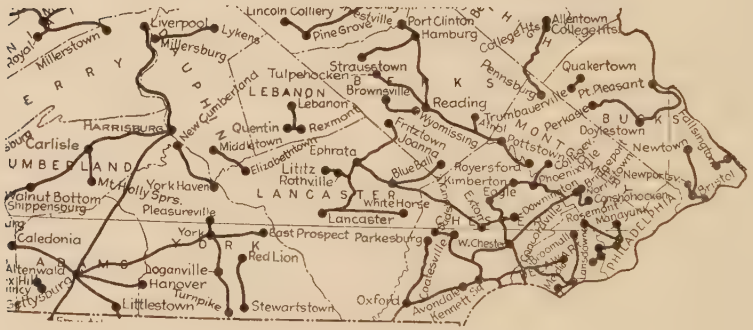
[10] Pennsylvania Department of Agriculture, Bureau of Marketing, 1925.

[11] U. S. Census, Special Agricultural Census, 1924.

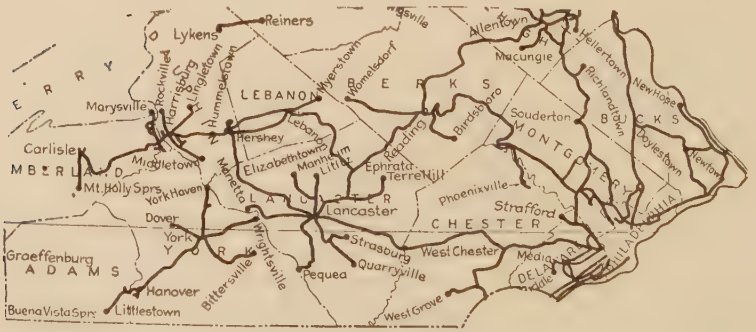
STEAM RAILROAD LINES



BUS LINES



ELECTRIC RAILROAD LINES



BASED ON DATA AS OF APRIL 1, 1924, FROM THE PUBLIC SERVICE COMMISSION OF THE COMMONWEALTH OF PENNSYLVANIA

0 5 10 20 30 40 50 60 70 80 90 100
SCALE - MILES

FIG. 4.—TRANSPORTATION IN SOUTHEASTERN PENNSYLVANIA

The Grange.—In connection with marketing, mention may be made of the Grange. This is an organization that attempts to improve rural conditions and make farm life more attractive. It concerns itself, too, with developing satisfactory agricultural legislation at Harrisburg. The Keystone Grange Exchange, a subsidiary body, sells farm produce and acts as a contracting and distributing agency for produce.

The agricultural fairs and farm-product shows stimulate agriculture and bring to the notice of the consumer the achievements of the agriculturist. An annual farm-product show is held each year in Harrisburg under the auspices of the Pennsylvania Department of Agriculture and the State College. In addition, practically every county has its agricultural organization. These organizations, such as the Chester County Agricultural Association, the Lancaster County Agricultural Fair Association, Hanover Agricultural Society, Stewartstown Agricultural Association, and the York County Agricultural Society hold annual fairs or exhibitions.

Highways and Transportation

Steam Railroads.—This region is located athwart the pathway of great east and west land routes. Such great carriers as the Pennsylvania Railroad and the Baltimore and Ohio connect it with the great markets of the northeast, west and south. The Philadelphia and Reading Railway, with its connections, the Lehigh Valley and Jersey Central, open up a nation-wide hinterland for its produce. Its southern sections are given outlets through the Western Maryland Railroad. The Pennsylvania System is all-pervading. Its great spokes of steel are thrust out from the hub at Philadelphia. It is the master artery of eastern transportation that taps the greatest consuming market in the world.

From these main-line railroads, branch lines honeycomb the area (Fig. 4). This is especially true of that part of the area which lies in the vicinity of Philadelphia, Reading, Trenton, Lancaster and York.

The Piedmont, if all of Berks and Philadelphia counties is included, has a railroad mileage of 1390,[12] divided among the

[12] Dewhurst, J. Frederick, *Survey of the Philadelphia Marketing Area*, p. 126.

counties as is indicated in Table 13. Five States in 1918 had a smaller total mileage than that of the Piedmont. Belgium[13] alone of the nations of the world had a denser network of track. The excellence of facilities for steam transportation is further illustrated in the comparisons set forth in Table 13.

TABLE 13.—STEAM RAILROAD LINES OF PIEDMONT COUNTIES AND SELECTED REGIONS, 1925[14]

Area	Miles per 10,000 Population	Miles per 100 Sq. Miles	Total Mileage
Adams	17.7	11.7	62
Berks	8.9	20.6	178
Bucks	13.8	18.6	113
Chester	18.9	27.9	217
Delaware	4.68	43.8	81
Lancaster	14.30	26.5	249
Montgomery	9.60	39.7	192
Philadelphia	.70	105.5	135
York	11.20	18.1	163
Piedmont	11.08	34.7	1,390
Belgium	7.10	47.93	5,451
Great Britain	5.10	19.52	23,709
Germany	7.20	23.02	39,600
Illinois	19.20	.22	12,126
Pennsylvania	13.20	.26	11,657
Maryland	10.40	.14	1,440
Connecticut	7.80	.21	999

Electric Railways.—Transportation facilities are further augmented by a complete and well-organized system of electric car service (Fig. 4). Eight suburban lines radiate from the city of Lancaster alone and reach at least twelve distinct areas of the county. York is the center of five such radiating lines. A close network of trolley tracks connects Philadelphia with outlying districts. Mileage statistics for electric roads are indicated for various counties in Southeastern Pennsylvania in Table 14.

[13] *Statesman's Year Book*, 1919.

[14] *Statesman's Year Book*, State Highway Department, "Survey of the Philadelphia Marketing Area."

TABLE 14.—ELECTRIC RAILWAY LINES OF SOUTHEASTERN PENNSYLVANIA[15]

County	Miles per 10,000 Population	Miles per 1,000 Sq. Miles	Total Mileage
Adams	4.0	2.7	14
Bucks	13.0	17.6	107
Chester	5.8	8.6	67
Delaware	6.1	56.8	105
Montgomery	5.6	23.1	112
Philadelphia	1.8	257.8	330
Berks	4.5	10.5	91
Lancaster	8.6	15.9	170
York	4.6	7.4	67

Thirty-six States of the United States have fewer miles of electric railway than the 1043 miles of this region. Two States, Texas (1022) and Washington (1074), have approximately the same mileage. Lancaster County contains more miles of electric railway than each of ten American States. Adams County, with only fourteen miles of track, has a greater mileage than Nevada or New Mexico. The Piedmont has 25 per cent of the total mileage of the State;[16] Pennsylvania ranks second among the States.

Highway Transportation (Fig. 4).—Produce and passengers are being carried to a greater and greater extent upon improved highways. The Philadelphia and Reading Railway Company is contemplating the utilization of fleets of motor trucks, for short hauls and as feeders for the railway. The National Freight and Delivery Service has received permission from the Public Service Commission to operate a consolidated trucking and delivery express service for the Philadelphia Metropolitan Area. This service provides for door delivery and collection of merchandise of all kinds to and from rail and boat terminals and points along established routes throughout the area. The main distributing center will be at Morton, Delaware County. Bus lines are opening up new territory and improving transportation in regions already partly supplied. Bus service between Philadelphia and Washington, New York, Wilmington and Media has been established. The extension

[15] Pennsylvania State Highway Department, Maps and Records.

[16] Philadelphia and Berks County included.

TABLE 15.—THE FARMS OF SOUTHEASTERN PENNSYLVANIA IN RELATION TO THE TYPE OF ROAD ON WHICH THEY ARE LOCATED[17]

(Comparison is made with other selected regions of the United States)

COUNTY, STATE OR SECTION	TYPE OF ROAD											
	Concrete or Brick		Macadam		Gravel		Improved Dirt		Unimproved		Others	
	Farms	Per Cent	Farms	Per Cent	Farms	Per Cent	Farms	Per Cent	Farms	Per Cent	Farms	Per Cent
Adams	189	5	491	14	58	2	908	25½	1860	52	51	½
Bucks	209	4	1227	21	346	6	768	13	2965	51	293	5
Chester	246	4½	1194	22½	177	3	472	9	2512	50	648	12
Delaware	113	12½	288	31½	4	½	185	20	267	29½	53	6
Lancaster	184	1½	3186	28	543	4½	480	4	4615	40½	2449	21½
Montgomery	143	3½	1712	40	347	8	375	8½	1224	30	449	10
York	498	6½	452	6	75	1	1298	16	5528	70	52	½
Southeastern Pennsylvania	1582	4	8550	22	1550	4	4486	11½	8971	48½	3995	10
Southeastern Wisconsin	2475	13	657	3½	10189	53	1087	5½	4056	20½	826	4½
Illinois	13026	6	3443	1	32473	14	81150	36	90479	36	5030	2

[17] United States Department of Commerce, Bureau of the Census, Special Agricultural Census, 1924.

of this service and the building of public highways by municipalities, counties and State are matters of present-day interest.

Improved highways that radiate out of Philadelphia provide additional outlets, that connect this section with the outside world. The great Lincoln Highway, joining the Atlantic and Pacific, passes through the heart of the region. Baltimore, Washington and the South are reached through the Baltimore and Wilmington pikes and the interlacing Lee Highway, Dupont Highway and the Old National Trail. The Reading Pike connects this region with the Lackawanna Trail and taps the region to the northwest. Along the Delaware River lies the Easton Road to the Catskill Mountains and the northeast. Ferries and a bridge across the Delaware River provide access to the White Horse Pike which leads to South Jersey and the sea. Well-paved roads connect with the William Penn Highway. From these great radial arteries branch lines are being built in every direction.

The use of motor vehicles, trucks in particular, has proved to be of great economic value in extending the farmers' field of operations. It has brought him within reach of new markets, made it possible to open up new land. It has also facilitated the development of new products that are more suitable to his location than were the general farm products of past decades. His ability to utilize motor vehicles to the fullest extent depends largely upon the type of road on which the farmer is located. An examination of the situation which is revealed in Table 15 indicates that the farmers of this region are not so well off relative to local roads as the farmers of other selected sections of the United States. The main highways in the region are excellent, but much could be done advantageously with the real rural highways. Southeastern Pennsylvania has only 46 per cent of its farms on improved roads, as compared with 75 per cent in Southeastern Wisconsin and 75 per cent in the State of Illinois. The relative comparison in regard to hard-surface roads is: Southeastern Pennsylvania 30 per cent, Southeastern Wisconsin 70 per cent, and Illinois 21 per cent (1924).

River Transportation.—Except for that part of the Delaware River which flows from Trenton toward Delaware Bay the area is poorly supplied with natural waterways. In the early days the traffic requirements were met by long lines of canals which have, however, been abandoned for the most part.

It is, of course, natural that the two larger rivers, the Delaware and the Schuylkill, should play the most important part in the development of the region. The neck between the two rivers was chosen as the site of Philadelphia. Access to the sea was at all times possible because the Delaware, occupying a drowned river valley, was tidal as far as Trenton. The Schuylkill, too, being tidal as far as Germantown, provided extra harbor space. With the coming of the canal, the road, the railroad and the trolley, these highways of trade have developed an increasing volume of commerce. Their importance in this study is that they provided the area with access to the sea and foreign markets, thus adding another important asset to a region already favorably endowed with trade and transportation facilities.

PART IV

AGRICULTURAL DEVELOPMENT

VI. HISTORICAL INTRODUCTION

Agriculture is an old-established industry in this region. The Chester County seal, chosen in 1683,[1] bears a plow, a significant symbol. A migratory type of agriculture prevailed at that time. Virgin land was cleared and utilized until returns began to diminish noticeably.[2] This land was then used for pasture, and more land was cleared and used for such crops as corn, wheat, rye and barley. The German farmers were more careful and proficient in clearing the land than their neighbors. They not only cut down the timber but grubbed out the stumps and burned the brush, thus making their fields as ready for crops the second year as they would have been in twenty years if they had merely girdled the trees and allowed them to rot, as was the custom among the other settlers.[3] The soil of the open clearings where the Indians had planted corn was already more or less worn out, so that other clearings were made as soon as possible. Crop rotation was not established for over a century.[4] It became more or less general about 1820. White clover was abundant as early as 1748, but red clover, which does so much to restore the impoverished fields, was not used successfully until 1785.[5] It is reported that the primitive fields retained their fertility for sixty or seventy years, producing an average of 25 to 35 bushels of wheat to the acre. After 1750, however, these same lands produced an average of only six or seven bushels to the acre. By the gradual use of plaster of paris, they were rejuven-

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[1] Day, Sherman, *Pennsylvania Historical Collections,* pp. 55, 150, 206, 290, 387, 480, 691.

[2] Kalm, *Travels,* Vol. I, p. 185.

[3] Rush, Benjamin, *Account of the German Inhabitants of Pennsylvania* (1789), p. 58.

[4] U. S. Department of Agriculture, Farm Management Bulletin No. 341, pp. 9, 10.

[5] Watson, J. F., *Annals of Pennsylvania,* Vol. II, pp. 485, 486.

ated to such an extent that they regained a large part of their early fertility.[6] The crop rotation which farmers eventually worked out was practically the one that is in use today: corn on sod, oats, wheat, timothy and clover pasture, hay, hay and pasture.

In 1714, in Thornbury Township, Chester County, there were 18 farms with a combined acreage of 4283,[7] of which only 784 acres were cleared. By 1726 the farms had increased to 23, the acreage to 5082.[8] The average farm of 221 acres contained less than 16 acres of plowed land. Today, 1925, the farm acreage has become 6280 and the crop land about 50 per cent of the total. The average size of farms in Chester County in 1765 was 135 acres.[9] Today it is 77 acres.

Before 1800 the townships along the Delaware River, in what is now Delaware County, contained a smaller proportion of woodland or uncultivated land than the townships of the interior. Tinicum Township in 1784 had 1579 acres[10] of marsh land and a larger proportion of cattle than any other township. Very few cattle today are found in Tinicum Township. The Chester Valley townships were also fairly well developed about Revolutionary times. In 1764 East Caln Township contained over 18,000 acres of assessable land. There were over 100 farms laid out there. The farmers owned 366 horses, 391 head of cattle and 519 sheep. West Caln Township, also in the Chester Valley, was divided into 85 farms, on which 161 horses, 205 cows and 316 sheep were kept. Other valley townships were equally well developed. After the war (1784) the number of farms had increased in the valley townships, especially in East and West Caln. Stock had decreased in number, perhaps on account of war demands. By 1784 there were recorded in Chester County (or what is today Chester and Delaware counties) 3,558 farms.[11] This was an increase of 339 farms in 20 years. Today (1925), there are 6,159 farms. In 1784 there were 10,107 head of cattle; today there are 60,000 head. Horses, similarly, are twice as numerous today, but there are less than half

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[6] *Ibid.*

[7] Cope, Gilbert, *Historical Sketch of Chester County,* p. 208.

[8] *Ibid.,* p. 210, 211.

[9] Chester County Tax List in Pennsylvania Archives, Third Series, II, 1-137.

[10] Cope, Gilbert, *Historical Sketch of Chester County,* p. 20.

[11] Cope, Gilbert, *Historical Sketches of Chester County,* p. 20.

as many sheep. Philadelphia, then, as now, was the principal market, but in 1800 its population was less than 1/10 of what it is today. Its demands, therefore, were more nearly supplied by the contiguous townships. Some butter, eggs, cheese, salt meat, wheat and poultry were taken to market by women, who rode on horseback with the butter pails suspended at the horses' sides. Peddlers, too, with horses and carts, gathered up the surplus products of the country-side. Clothing was largely of homespun from flax, hemp and wool, that was grown on the farms. The agricultural life in those days was laborious. No women, however, except the Germans, worked in the fields. They looked after the dairy, the poultry and the garden. It was difficult to obtain help until the English, Scotch-Irish and Germans began coming in larger numbers. Among them were many redemptioners, or indentured servants.[12] It was partly on account of this labor shortage that only small sections of the farms were actually under cultivation. Even the care of the plowed land was superficial and negligent. Since the farm houses were scattered thinly throughout the area, few contacts were possible, and the people had little opportunity for intellectual and esthetic culture. Their pleasure, according to some historians, consisted largely of the gratification of animal passions or appetites. Self-sufficiency was a striking and important characteristic of these farms. Practically the only articles on the farmer's table that were not "home-made" were salt, molasses, rum, tea and coffee.[13]

Early markets of any substantial nature were lacking. The products of these farms were practically the same as those of European farms. The inevitable result was the continuance of small-scale, non-commercial farming. It was the scarcity in Europe resulting from the European wars that brought about the import of wheat from the colonies. In 1793 the exports of American wheat reached almost 1,500,000 bushels.[14] Flour, too, was exported (1,000,000 barrels). Philadelphia, on account of its strategic position in the center of this outstanding wheat area, became by 1765 the most important center of the grain trade. In 1765 Philadelphia exported 367,522 bushels of wheat and 18,714 tons of flour and bread. The exports of flour from Philadelphia just before the

[12] Kalm, P., *Travels,* Vol. I, p. 388.

[13] Bidwell and Falconer, *Agriculture in the Northern U. S., 1620-1860,* July, 1916, p. 18.

[14] Pitkin, *Commerce of the U. S.* (1835 edition), p. 96.

Revolution averaged 268,000 barrels a year. By 1792 they had increased to 420,000 barrels.[15]

These new demands for agricultural products gave an added incentive for the development of the land. There were at this time abandoned unenclosed tracts[16] that were called "Old Fields." They had been exhausted of their fertility and then deserted. It was to reclaim such sections as these and to replenish the fields in general that the use of plaster of paris, already described, became common. On first application this fertilizer proved successful, but it was found that its effects were greatly diminished by repeated applications. The liming process, although developed more slowly, soon came into favor, with a consequent improvement of soil conditions.

From 1810 to 1840[17] there was rapidly developing an industrial population in this region. In 1810 an English family[18] named Bottomly converted an old water-propelled saw mill in Concord, Delaware County, into a woolen factory. At the beginning of the war (1812) a small stone woolen factory was erected on Cobbs Creek in Haverford Township. Business became so good that it increased by the establishment of other mills. Delaware had the advantage among the counties by its favorable location for this work. It had the rapids and falls of the many streams that poured from the crystalline Piedmont to the coastal plain below. Moreover, it was close to population centers. The manufacturing industry had come to stay and, incidentally, to create a home market for agricultural produce. Although this period was characterized by a large European demand for American breadstuffs,[19] to supply the deficiencies caused by war and by crop failures, yet so rapidly were the manufacturing villages growing that the local market became more important to the farmer than his exports. In the years 1808 to 1814 foreign trade suffered serious interruptions, caused first by the Embargo and Non-intercourse Acts, and then by the War of 1812. Surplus stocks, accumulated during the war, were exported at its close, and a period of temporary prosperity was thus brought about that lasted until the panic of 1819. During the next decade Europe was able to supply her own foodstuffs, and, in England, tariff in

[15] Proud, *History of Pennsylvania*, Vol. II, p. 355.
[16] Smith, George, *History of Delaware County*, 1862, p. 355.
[17] Bidwell and Falconer, *Agriculture in the Northern U. S.*, p. 196.
[18] Smith, George, *History of Delaware County*, 1862, p. 356.
[19] Bidwell and Falconer, *Agriculture of the Northern U. S.*, p. 196.

the form of corn laws kept out wheat to a large extent. Luckily, the home market continued to develop. Its importance to the farmers of this region at this time can hardly be over-estimated. Manufacturing became distinct from agriculture. A new specialized non-agricultural class became consumers, but not producers, of agricultural products. Agriculture became an independent specialized industry, no longer sufficient unto itself. It must not be supposed, however, that this progress was made rapidly. The market developed very slowly at first. The farmers, themselves, were very conservative. They lacked scientific knowledge and business enterprise. They clung to their old ways. Only gradually did they give up household manufactories and modify their farm management to meet market demands.

The census records of population reveal the growth of the home market. In 1790 Eastern Pennsylvania had a population of 325,000, or 15.4 people to the square mile. A gradual increase gave the same region a population of 995,000 in 1840. The density had increased to 47. Philadelphia, including the county, had 55,000 inhabitants in 1790, and 258,000 in 1840.

The beginnings of better farming were found near Philadelphia, where the farmers were stimulated by the educational propaganda of the agricultural societies. Rising prices, too, were an encouragement. Competition, such as had not prevailed in the domestic epoch, arose between farms. Now, differences in fertility and location resulted in different costs of production. The market in this way acted as a selective force. Good land became sharply differentiated from poor.

Factories were beginning to compete with the farms for the man power of the community, and a great need arose for farm hands to work the land. Accordingly the situation arose in which industrial communities were requiring additional products from the farmer, and at the same time depriving him of that labor which was an essential factor in production. Diminishing returns on the farms of the east had set in by 1840. Unless improvements in method were developed, increased output could be had only at higher costs. Thus the labor situation acted as a check to the development of commercialized agriculture. The farmers were baffled for a time, but the situation was saved by the invention of several important farm machines; the horse rake, reaper, cultivator and thresher. Horse power, then, was gradually substituted for

man power. Improvements in machines continued, and this region passed into a new stage of agricultural development.

Chester was the leading agricultural county at this time. Table 16 shows the position of the different counties in agriculture, commerce, manufacturing and trade.

TABLE 16.—PERSONS EMPLOYED IN VARIOUS OCCUPATIONS IN 1840[20]

County	Agriculture	Commerce	Manufacturing and Trade
Chester	11,571	365	4,550
Lancaster	10,285	250	3,928
Montgomery	8,382	197	3,764
Bucks	8,247	428	2,737
York	5,525	175	3,349
Delaware	3,302	52	2,088
Adams	1,522	6	829
Philadelphia	3,675	8,727	29,223

The different counties experienced major agricultural development in 1840 along somewhat similar lines. Farming was the predominant industry everywhere. The two foremost counties, Lancaster and Chester, were fairly equal agriculturally. Chester County leaned more toward the raising of animals, while Lancaster County crops were superior, especially wheat, oats and corn. Montgomery, Delaware and Bucks were the banner dairy counties, having a superior location adjacent to Philadelphia. The city was not large enough nor transportation efficient enough for the dairying regions to be far removed from the centers of population. Lancaster, York and Adams were like frontier counties in those days.

In southeastern Pennsylvania, one of the old and important centers of improved agriculture in 1840, three systems of husbandry were practised: (1) The cropping system, which was usually followed by the German farmers on the best land. In this system nearly all the land was cropped in a rotation of corn, oats or barley, wheat and clover. (2) A mixed system, in which a part of the farm, well watered, was kept aside for permanent pasture and received a frequent top dressing of lime or short manure. The remainder was cropped, as in the first system. (3) The grazing system, uniformly adopted in the eastern counties near Philadelphia for dairy purposes and for feeding cattle. Very little plowing was done in this system and merely enough grain was raised for the consumption of the family and livestock, the remainder of the farm

[20] U. S. Bureau of Census, Sixth Census (1839).

being given to pasture and hay. Near the cities and large towns where the farms were generally smaller, fruit, vegetables, poultry, fresh butter and other articles for immediate consumption were found profitable. Scarcely a farm was to be found without its apple orchard of choice and selected varieties. Chester County, especially, was constantly held up by the agricultural papers and periodicals of the time as a striking example of the "improved system" of agriculture. In particular it was famed for the feeding of western cattle. The adjoining county of Delaware was noted for the quantity and quality of the fresh butter, veal and poultry which it furnished to the Philadelphia market. Both counties were praised for their clean and well-arranged farms, the well-built fences, the well-constructed farm buildings located where it was most practicable, in the immediate vicinity of a spring.[21]

Agricultural Modifications

About the middle of the 19th century the farmer of the east sustained a set-back. The middle west was developing rapidly. Agricultural machinery was being improved, thus making it possible to farm larger areas with the same labor supply. Production was less costly on these large western farms than on those of the east. The eastern farms were originally small because of the lack of improved farm machinery at the time of establishment. Rapid enlargement under the circumstances was impossible. Improved transportation facilities brought these cheaply produced western farm products into the eastern markets. These conditions brought about severe competition for the eastern farmer. As a result certain changes in eastern farm activities were imperative. Many of these changes were the same throughout the entire region, with only slight variations necessitated by different economic and natural conditions.

Animal Industries

Sheep.—Various phases of the animal industry suffered most by the then developing changes. Sheep raising was most seriously affected. Sheep had been fairly well established by 1830 after having a hard time getting a foothold,[22] due to wolves and Indians.

[21] *History of Agriculture in the Northern United States, 1620-1860,* p. 261.

[22] Connor, L. C., "A Brief History of the Sheep Industry in the United States," *Annual Report of the American Historical Association,* Vol. I, 1918, pp. 93-197.

TABLE 17.—CENSUS DATA SHOWING CHANGES IN THE SHEEP INDUSTRY, 1840-1925

County	1840	1850	1860	1870	1880	1890	1900	1910	1920	1925
Adams	19,140	7,723	5,865	6,097	5,692	7,446	6,352	7,122	3,148	3,064
Bucks	27,244	14,579	11,097	7,404	5,228	2,702	1,985	2,154	2,062	1,218
Chester	56,700	13,400	11,700	13,800	15,100	11,200	9,876	5,325	5,556	3,522
Delaware	7,121	7,424	2,566	2,142	1,629	948	1,324	1,475	1,555	678
Lancaster	41,967	19,876	7,087	11,821	7,064	5,760	6,009	5,882	5,245	3,396
Montgomery	15,249	10,982	4,547	3,623	2,809	1,803	3,166	2,485	2,485	2,040
York	36,347	13,531	12,592	14,068	8,533	8,677	4,753	4,120	2,667	2,736
Total	203,768	87,515	55,454	58,955	46,055	38,536	33,465	28,563	22,718	16,654

In 1830 began the period of greatest development in eastern wool growing. Woolen manufacture was at last firmly established and encouraged by tariff protection. It had increased its output and demand for raw materials. The total consumption of wool in the factories was estimated in 1837 at 38,300,000 pounds, of which about 10,000,000 pounds was of foreign origin. Shipments from Ohio and the States west of the Alleghenies had begun but were not large enough to cause eastern growers serious concern. As a result, wool prices in the east were high (seventy cents a pound).[23]

Between the years 1840-1850 the number of sheep had decreased approximately 57 per cent. The decrease continued until at present less than 17,000 sheep are found in the entire region. The greatest decrease was in the county of Chester, where it amounted to over 93 per cent. Today the sheep of the seven counties of the Piedmont amount to slightly more than 8 per cent of the number in 1840 (Table 17).

The area, from a topographic basis, appears to be well suited to the raising of sheep. "In the minds of many of the early settlers of the west, who were acquainted with these rough sheep-raising sections of the east, the impression prevailed that the western climate and prairie lands were not adapted to the raising of wool. It was assumed that the prairies were too level for sheep, afforded no protection against winds, and gave little chance for climbing."[24] Large areas of the Pennsylvania Piedmont are rough and unsuited for the plow. This is especially true in the extensive crystalline section of Chester County, where the decrease was the greatest. The summer weather is rather trying for sheep, but this is counterbalanced by the lack of severity of the winter weather. Feeding should not be a difficult winter problem. Sheep, however, thrive best in fairly cool regions where there is plenty of short, sweet grass, and where the air is often moist and the nights fairly cool with heavy dews, but where the rainfall is not heavy. The climate of this region is far from being ideal for sheep (Chapter II, "Climate"). Economic conditions were, however, the most compelling. "Sheep were in demand in the west. The driving of large flocks of sheep from Ohio and Pennsylvania into the newly settled west began in the forties. By 1843 sheep were said to be pressing westward at an enormous rate."[25] In 1844, the great sheep

[23] *History of Agriculture in the Northern U. S., 1620-1860,* p. 221.
[24] *Prairie Farmer,* IV, 1844, p. 238.
[25] Sears, *Pictorial Description of the U. S.,* 1848, p. 546.

year, it was said, "The rush of sheep from the east into Illinois, Wisconsin and Missouri was a perfect tornado."[26]

Sheep were more cheaply produced on the larger farms of the west. It cost one dollar to two dollars a head to raise eastern sheep, 25 cents to one dollar to raise the western.[27] This was in the period immediately prior to 1860. Superior marketing position did not count much in the face of such a handicap. The fight against disease and dogs is also a more hopeless one in the more densely settled east. Here, in the year ending June 1, 1890,[28] over 300 sheep had been killed by dogs and more than 2,000 had died from disease and weather. This was about seven per cent of the total number. The dog menace has not decreased. In 1923 the number reported killed by dogs was 147.[29] This was a percentage of .007, as compared to .009 in 1890. Dog laws are getting more stringent, and at present counties pay sheep bounties. But even now dog depredations prevail and counties frequently do not appropriate sufficient amounts to cover losses. Many farmers gave up because the loss of pure-bred sheep was only partially made good, the price of ordinary animals being their only compensation.

Sheep are usually associated with extensive farming and even in this region tend to gravitate to the larger farms. Western sheep could roam over vast areas; here expensive fences had to be built and maintained. Sheep would be profitable in small numbers on small farms as scavengers, but in large numbers the fight against disease and dogs is a most difficult one. Since 1922 the enforcement of the dog law has been taken over by the State Bureau of Animal Industry. This may alleviate the situation somewhat. No hope for a quick revival is seen. The area is too far removed from the supply of feeders to profit from the winter feeding of lambs. All things considered, other interests are more worth while. The steer, the hog and the dairy cow will tend to keep the sheep out of this region and in the cheaper land areas. This will be especially true of the wool sheep. There are some possibilities of raising mutton sheep and a few lambs here.

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[26] *Prairie Farmer*, IV, 1844, p. 204.

[27] Connor, L. C., "A Brief History of the Sheep Industry in the U. S.," *Annual Report of the American Historical Association*, Vol. I, 1918, p. 115.

[28] U. S. Census Report, 1889.

[29] Pennsylvania State Department, Departmental Statistics, 1924, pp. 11, 12.

Swine.—Hogs, likewise, decreased in number during this critical period (1840-1850). They had been generally distributed over the entire area, with the greatest concentration in the dairy districts. In Eastern Pennsylvania[30] hogs had been fed on the refuse from the dairy, on pasture and nuts during the summer, and on the stubble fields and large orchards in the fall. Then they were fattened on corn. The decrease was 31 per cent, as compared to the 57 per cent decrease in sheep. In 1880 the industry began to improve. It was not until the beginning of the century that there occurred a second decline, which continued until the war demand began to be felt. In 1920 the production was about 81 per cent of normal. All counties of this region, except Lancaster, Chester and Delaware, had more hogs in 1920 than they had in 1840. Chester County had only half as many, but Lancaster and Delaware had 96 per cent.

The next five years witnessed what was nearly a cataclysm in this industry. The bottom almost dropped out of the business. On January 1, 1925, the number of hogs on farms here was only 55.6 per cent of the number that was raised in 1840. This was a continuation of the previous decline that had been halted only by wartime demands. There was a drop in hog prices from $13.66 per hundred weight[31] (1915-1919) to $9.94 per hundred weight (1920-1923). In 1922 hogs went down to $9.39 per hundred. This was only 17 per cent higher than pre-war averages (1910-1914). Almost everything that the farmer had to buy was proportionately much higher.

Large incomes had been derived from raising hogs in 1840, but competition with the corn belt hog raisers became so keen that the situation was altered. Refrigeration and cheap corn produced on cheap land made the corn belt product economically superior at that time.

It appears that the causes of decline in hog raising in the east were: (1) in the increased attention given to dairying, (2) the importation of western pork, (3) the general improvement in agriculture in Eastern Pennsylvania, (4) low cost of production in the west. Six cents a pound was the commonly estimated cost of pork

[30] U. S. Patent Office, Annual Report, 1850. Agriculture 214 (1849), p. 127. Taken from the *History of Agriculture in Northern U. S., 1620-1860,* p. 143.

[31] Chicago prices.

TABLE 18.—CENSUS DATA SHOWING CHANGES IN THE SWINE INDUSTRY, 1840-1925

County	1840	1850	1860	1870	1880	1890	1900	1910	1920	1925
Adams	31,582	20,571	18,864	18,875	22,172	27,543	25,835	22,008	33,393	25,225
Bucks	38,516	29,104	18,205	25,159	29,979	37,181	33,953	24,477	40,620	17,368
Chester	64,543	36,591	31,515	28,165	33,959	35,577	30,476	21,406	33,672	15,609
Delaware	12,426	11,287	9,039	7,759	9,319	6,208	6,627	6,590	11,985	5,030
Lancaster	75,026	57,535	54,826	50,070	59,027	66,742	57,882	47,259	72,094	43,282
Montgomery	32,707	24,678	21,337	18,931	21,160	24,009	22,237	18,956	38,985	18,398
York	56,297	34,603	41,182	40,083	66,983	53,992	55,198	48,073	68,482	48,165
Total	311,097	214,369	194,968	189,042	242,599	251,252	232,208	188,769	299,231	173,087

production in the east in 1850; in the west it was only from two to two and a half cents.[32]

Conditions are somewhat better today in this region for hog raising than they were in the seventies. The superiority of the corn belt is not now so outstanding, although it is still the most economical region in which to raise hogs. Land there is increasing in price, and costs of production are increasing. The fact that the demand is increasing all over the United States as the population grows is naturally favorable to the industry here. Furthermore, no hereditary enemies like the dog need worry the hog raiser. In the middle west hog belt there is no permanently cheap land such as there is in the mountain States where sheep may be grazed. The fact, therefore, that this region increased its corn crop from a 4,000,000 bushel crop in 1840 to an 18,000,000 bushel crop eighty years later is significant. In spite of these propitious circumstances, however, this region will not place its main interest in hog production. They will be raised in larger proportions in those sections which have least favorable marketing conditions, such as Adams County, which had almost 80 per cent as many hogs in 1925 as it did in 1840. They will be raised, too, where they can be profitably combined with some other crop, as they are with apples in Adams County. On the whole, other more profitable products will be given the main attention. Hogs will be found on almost every farm, but in a subsidiary capacity.

Cattle.—The cattle industry also had decreased during the period 1840-1850. The region pastured 256,000 head of cattle in 1840. By 1850 it had only 235,000 head. Dairy cattle in those days were greatly in the minority. The cattle registration in 1860 was approximately 267,000. Since that time there has been a slight decrease. On January 1, 1925, there were approximately 256,000 head of cattle on the farms of this region. Dairy cattle are at present, however, in the majority. The beef cattle division of the industry never recovered from the conflict with the western ranges. Its place was filled by the increase in the dairy business.

Lancaster County beef cattle industry best withstood the blow. Today it has over 60 per cent of the beef cattle of the entire area. The business is not increasing, however. Proportionately, it is decreasing in importance.

[32] *Agriculture in Northern U. S.*, p. 439.

This county had long been the center of eastern cattle feeding. Stock had been both raised and fattened here. The former part of the industry has practically disappeared. Fattening steers was profitable business and the usual thing among farmers was to fatten from twelve to twenty head annually of cattle that had been brought in by drovers from the west.[33] The beef cattle industry had early profited by the decline of distilleries in the region. The grain formerly used for distilling was used for animal feed.[34]

Today beef cattle number 32,816 head (January 1, 1925). This is only about 70 per cent of the number of dairy cattle. In Chester County beef cattle number 4,987 and dairy cattle 46,732 (1925). Beef cattle are economically feasible in this region only in selected areas. Distances from the ranching country where feeders can be obtained is a great handicap. There is no possibility of competing with the cheap western semi-arid lands as a ranching section. The beef cattle business must be confined to the fattening of ranch-produced stock. Iowa, much nearer to the source of supply of feeders and on the average able to produce more corn to the acre with less outlay for fertilizer and labor, is a better fattening region. Moreover, since the great slaughtering centers are in the west, this region has practically no market advantages.

Lancaster County could withstand this competition better because of agricultural advantages, limestone soil and plain-like topography being more prevalent there. The corn crop was not influenced noticeably by western competition, except to change slightly in location. There is today a more noticeable concentration on the best land. It increased gradually through this period of stress until in 1920 it had become a 5,000,000 bushel crop. The corn crop of Lancaster County is fully twice that of Chester County and four times that of Bucks County. It has always been greater, at least since 1840. This corn crop is fed to beef cattle, which in turn maintain the fertility of the soil by providing barnyard manure.

Again we notice that the dairy industry did not rise so quickly in Lancaster as it did in Chester and Bucks counties. In 1870 Chester County was selling 1,598,000 gallons of milk, Bucks County, 1,030,000 gallons, and Lancaster County only 143,000 gallons (Table 19). Lancaster County milk sales did not exceed those of

[33] U. S. Patent Office Annual Report 1852, p. 240, Agriculture.
[34] *Ibid.*, 1845, p. 337, Agriculture.

TABLE 19.—CENSUS DATA SHOWING CHANGES IN MILK SALES, 1869-1924 (GALLONS)

County	1869	1879	1889[35]	1899	1909	1919	1924
Adams	16,000	28,900	780,000	1,629,000	1,567,000	2,464,000	2,588,399
Bucks	1,032,000	2,308,000	11,000,000	12,954,000	9,455,000	8,982,000	9,083,983
Chester	1,598,000	5,759,000	20,000,000	17,038,000	20,206,000	19,549,000	20,890,101
Delaware	1,637,000	3,412,000	5,024,000	5,947,000	4,714,000	3,160,000	2,877,047
Lancaster	143,000	372,000	8,000,000	12,192,000	10,928,000	14,957,000	15,637,368
Montgomery	3,508,000	5,534,000	13,000,000	13,677,000	10,777,000	10,635,000	9,839,192
York	230,000	513,000	2,308,000	4,743,000	4,026,000	6,514,000	7,878,951
Total	8,164,000	17,926,900	60,112,000	68,180,000	61,673,000	66,261,000	68,795,041

[35] Estimated.

TABLE 20.—CENSUS DATA SHOWING CHANGES IN FARM BUTTER MANUFACTURE, 1849-1924

County	1849	1859	1869	1879	1889	1899	1909	1919	1924
Adams	620,000	863,000	957,000	1,092,000	1,313,000	1,215,000	1,192,000	542,000	420,000
Bucks	2,336,000	2,753,000	2,862,000	3,892,000	1,495,000	805,000	669,000	357,000	143,000
Chester	2,092,000	2,730,000	2,848,000	4,247,000	1,628,000	1,314,000	573,000	316,000	146,000
Delaware	1,342,000	1,649,000	1,143,000	1,428,000	628,000	399,000	168,000	122,000	77,000
Lancaster	1,908,000	2,552,000	2,462,000	3,381,000	3,064,000	2,657,000	2,734,000	1,479,000	1,287,000
Montgomery	3,048,000	3,346,000	3,105,000	4,166,000	1,669,000	690,000	372,000	178,000	65,000
York	1,083,000	1,535,000	1,737,000	2,061,000	2,481,000	2,317,000	2,234,000	1,693,000	1,548,000
Total	12,429,000	15,428,000	15,114,000	20,267,000	12,278,000	9,397,000	7,942,000	4,687,000	3,686,000

Bucks County until 1910. Chester County still leads. The beef cattle industry would no doubt have been more important than it is today if the demand of Philadelphia and other urban centers for market milk had not developed. To furnish this demand, Chester, Delaware, Bucks and Montgomery counties, for a time, had the advantage over the others. Dairying in these counties took the place of beef cattle fattening. Pasturage took the place of cornfields. Today Chester County has 13,020 acres more of pasture than Lancaster County. There is more land suitable for pasture in the crystalline uplands than in either the sandstone lowlands or the limestone plains. All regions furnish an excellent supply of water for animal purposes. Dairying will likely supersede the beef cattle business even in Lancaster County. The trend is beginning to be noticeable.

Butter and Cheese.—The manufacture of these products on the farm was an important adjunct to the dairy business in early days. In 1849 butter amounting to over 12,000,000 pounds was produced on the farms here. At the same time there were manufactured over 75,000 pounds of cheese.

The manufacture of butter on the farms reached its peak in 1879 (Table 20). This was likewise true of cheese manufacturing (Table 21). The same three counties that led in the manufacture of butter in 1849 were also ahead in 1879. Chester County had become the principal butter county in 1879. After 1879 the business began to decline very rapidly (Table 20). The total production of butter in 1889 amounted to approximately 59 per cent of the peak production. Lancaster became the leading farm butter county. Increases in butter manufacture continued in the fairly remote counties of York and Adams. The production in Chester County was only 38 per cent, Montgomery 25 per cent, and Bucks 39 per cent of the great output of 1879. The decline has not only continued, but it has affected all the counties of this region. The year 1919 recorded about 23 per cent of the peak production of 1879. York County had taken the lead. Cheese was now (1919) 64 per cent of the production in 1879. Lancaster County was the heavy cheese producer, its production more than equaling the output of all the rest. Much of it was cottage cheese. These two industries are still declining in importance in every county.

Factors that caused butter and cheese making on the farms to decline are (1) the development of the manufacture of factory

TABLE 21.—CENSUS DATA SHOWING CHANGES IN FARM CHEESE MANUFACTURE, 1849-1919

County	1849	1859	1869	1879	1889	1899	1909	1919
Adams	1,180	1,086	760	191	1,100	1,142	644	468
Bucks	6,342	8,716	12,547	11,859	10,620	9,040	10,759	7,427
Chester	33,012	30,527	8,526	11,300	6,127	32,465	1,737	10,895
Delaware	7,210	8,502	4,400	7,904	4,000	13,065	7,000	9,010
Lancaster	13,343	49,355	82,614	100,991	83,166	78,176	185,075	65,030
Montgomery	10,662	52,886	195,057	342,004	118,543	82,140	74,811	28,837
York	4,032	10,094	16,150	13,349	8,659	18,342	13,761	26,000
Total	75,781	161,166	320,054	487,598	232,215	234,370	293,787	147,667

TABLE 22.—CENSUS DATA SHOWING CHANGES IN THE PRODUCTION OF TOBACCO, 1839-1919

County	1839	1849	1859	1869	1879	1889	1899	1909	1919
Adams	0	0	300	925	5,610	16,649	3,700	25,944	8,000
Bucks	15	0	15,288	151,372	1,160,970	325,280	71,770	0	2,000
Chester	20	0	1,217	2,400	633,632	679,265	339,490	551,193	941,000
Delaware	0	0	4	0	12,347	0	0	0	0
Lancaster	48,860	378,050	2,001,547	2,692,584	23,946,326	19,217,800	28,246,160	36,892,869	49,355,000
Montgomery	0	100	4,827	50	20,930	0	350	7,210	2,000
York	162,748	410,555	595,405	527,808	5,753,766	6,222,107	6,167,490	6,281,294	4,252,000

butter and cheese, (2) the competition of western butter and cheese makers, and (3) the growth of the demand for market milk. In the middle west agricultural conditions made it possible to produce cheap grain and forage for feed stuffs.[36] Butter and cheese could be shipped to eastern markets at relatively small expense. Milk in Wisconsin was accordingly turned into butter and cheese. Wisconsin produced 10,000,000 pounds more butter in 1859 than she did in 1849 and continued to increase all through this period (1849-1899). Pennsylvania factories, too, turned out an increasing product up until the late nineties.

The west is also making a specialty of butter and cheese manufacture because of location. Their butter is better because its making is a major industry. More skill is applied in its making; dairy education is farther advanced; butter exhibits are the rule, not the exception. Butter boards are lacking here. Many of the creameries in this region are being operated only eight to nine months in the year; that is, in the late summer and fall, when there is a surplus of market milk. This is not true, however, of the limestone regions. Most of the farmers in the limestone sections have very little permanent pasture; consequently there is no apparent advantage in producing milk in the summer months rather than in the fall and winter. Dairying, however, outside the limestone belts, has the excessive summer production.

In 1879, when the butter production was at its peak, approximately 18,000,000 gallons of milk were being sold in this area by the farmers. This was 25 per cent of the amount sold twenty years later, when the butter production had fallen away. The counties in 1899 that were selling the most fresh milk were also producing a small amount of butter proportionately. These counties were Chester, Montgomery, Bucks and Delaware. These counties were reached first by the increased demand for market milk. In 1889, when York County farmers were producing over 10,000,000 gallons of milk, and selling only 2,000,000 gallons, Chester County farmers were selling over twice as much as the former county produced (Table 19). The increased demand for milk from the condensed milk and evaporated milk factories will no doubt cause a still further decline in butter making everywhere throughout the area.

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[36] U. S. Department of Agriculture, Bulletin No. 341, p. 15.

TOBACCO

Competition with the west no doubt brought on hard times and the need for a readjustment in eastern agriculture. Prosperity in the west had made Philadelphia grow, and this also reacted on the agriculture in the areas near by. Chester County tried tobacco. It was introduced about 1880 and for a short time had a remarkable development. Tobacco production jumped from 2,400 pounds in 1869 to 600,000 pounds in 1879 and 1889 (Table 22). The business ceased to grow, however, probably on account of prejudice, a small percentage of favorable soil, and the development of other interests.

It remained for Lancaster County to develop the tobacco specialty. In 1839 it produced 48,860 pounds. At that time it was exceeded in production by York County (162,748). The period 1839-49 saw the production increase to 378,050 pounds. It became a two million pound crop in 1859. The crop today amounts to over fifty million pounds. The development of this industry has been phenomenal. Lancaster County produces the bulk of the tobacco grown in Pennsylvania (Table 22).

OTHER CHANGES

The horse was also to replace oxen about this time. The reasons ascribed for this change were many:[37]

(1) For working in the woods, or for breaking up a tough new sod, or for ploughing fields filled with rocks and stumps, the ox was quite generally preferred to the more nervous and energetic horse. The price of a yoke was less than that of a harness. The ox would continue to grow for several years and could then be disposed of for beef, thus serving a two-fold purpose. The horse, on the other hand, was more tractable and worked at a more rapid rate. The growth of cities in the east was causing an increasing demand for horses. With the building of roads and the trend towards a more commercialized agriculture, more and more of the produce was sent to market. In this work the horse was the superior animal. Fields also in the east were being cleared of stones and stumps and the sod was more frequently broken than formerly. Cattle were now sent to market at an earlier age, so that an increasing portion of the cost of raising the ox had to be paid for by the work accomplished. Still another reason for the change was the increased use of farm machinery. Moreover by 1860 things

[37] *Agriculture in Northern U. S., 1620-1860,* p. 310.

were moving at a faster pace, the wages of labor were higher, time was more valuable, consequently the more rapidly moving horse was the animal preferred.

GENERAL CROPS

Corn and wheat have increased considerably in the number of bushels produced (Table 23). Corn increased three-fold. The increase in this crop after the forties was a result of three causes: (1) A larger amount was planted in substitution for fallow; (2) more manures were applied; (3) more care was taken in tillage.[38] The increase in wheat was slightly less. Rye production had formerly been concentrated here. It was usually grown in smaller fields on the poorer soils, and was frequently substituted for wheat after that crop ceased to thrive. The introduction of new varieties of wheat quickly changed all this. This improvement, together with the renewal of the fertility of eastern soils, allowed wheat to recover some of its former standing. Rye culture declined. Further reasons for its decline were ascribed by many to frequent attacks of rust, the improvement of farming methods, the introduction of Mediterranean wheat, and the consequent increase in the wheat yield.[39] The 1839 wheat crop in Bucks County was about 41 per cent, and the corn crop about 60 per cent of the present crop. In Chester County the percentages are wheat 52, corn 43, and in Lancaster County wheat 50 and corn 32. Wheat has had proportionately the greatest increase in Bucks County and corn in Lancaster County. This increase, however, has not kept pace with the increase in population, for by 1860 the eastern industrial States provided the leading market for the surplus products of the west. New York and Pennsylvania in 1839 raised 6 bushels of wheat per capita. In 1859 they were raising only 3 bushels. The western States, on the other hand, were raising 7.4 bushels of wheat per capita in 1839 and 13.3 bushels in 1859. The western States were raising also 33 bushels of corn per capita in 1839 and 45.7 bushels in 1859.[40]

Transportation development was bringing a closer interdependence between the farms of the west and the rapidly developing industrial centers of the east. It was likewise bringing the western

[38] *Agriculture of the Northern U. S., 1620-1860,* p. 340.

[39] U. S. Patent Office, Annual Report of 1849, "Agriculture," p. 123. Taken from *History of Agriculture of Northern U. S.,* p. 334.

[40] *Ibid.,* p. 311.

farmer into keen competition with the eastern. Each locality was especially fitted for certain types of agricultural development. The earlier agricultural system of the east required readjustment to fit these new conditions. Barley and flax are no longer important and oats is decreasing in acreage. Hay has had a very remarkable development. It became more of a cash crop after 1850 on account of a greatly increased demand by the Philadelphia market. It is a valuable adjunct to dairying.

Table 23.—Census Data Showing Corn and Wheat Production, 1839-1919

County	1839	1859	1879	1899	1919
Adams:					
Corn	290,724	551,110	775,761	1,382,490	2,244,897
Wheat	216,606	401,885	612,779	604,680	911,809
Bucks:					
Corn	680,128	1,308,381	1,860,186	2,242,450	1,527,070
Wheat	236,915	547,988	520,870	542,200	516,398
Chester:					
Corn	826,413	1,589,844	1,964,532	2,686,790	2,793,850
Wheat	438,132	800,663	775,312	785,300	989,442
Delaware:					
Corn	178,264	381,296	516,633	519,180	340,489
Wheat	91,381	169,273	140,140	152,170	112,363
Lancaster:					
Corn	1,307,600	2,648,398	3,293,292	4,523,550	5,205,807
Wheat	1,129,277	2,125,722	1,927,767	1,906,440	2,263,850
Montgomery:					
Corn	503,065	1,076,546	1,521,097	1,938,060	1,698,905
Wheat	181,858	338,933	486,763	368,840	448,865
York:					
Corn	600,822	1,255,809	1,739,865	3,066,320	4,652,217
Wheat	357,515	771,088	1,211,340	1,242,150	1,637,110

The agriculture of the east has changed and continues to do so. Hogs, beef cattle and sheep had been generally found unprofitable under conditions of western competition. The production of special crops, such as tobacco, apples, mushrooms and nursery products was developing rapidly. Dairying, based on hay and pasture, and owing its development to the increase in industrial population, was becoming more and more important. Agriculture was being helped here as elsewhere by the improvement in farm machinery and farming methods. The horse was replacing the ox. The rise

of industrial centers was creating new and larger markets. Improvements in transportation were making these markets increasingly accessible to the farmer, and making eastern agriculture more and more of a commercial enterprise, by bringing farmers more sharply into competition with each other and with other farmers throughout the country. Farming was getting to be a job for the skilled and progressive. Since the unfit and the unprogressive are only gradually weeded out, progress was slow. The new era of eastern agriculture which had taken its rise about 1860 was now in full development.

Present Conditions

Farm Conditions.—Actual farm production in Southeastern Pennsylvania is in the hands of a farming population of 180,226 (1925). This is approximately one-fifth of the farm population of the State and about 20 per cent of the total population of the area. These farmers (1919) were over 93 per cent native whites. Negro farm population was 2,696 (1925). The foreign-born farmers are as yet few in number. They are slowly increasing, however, as the number of other groups decreases. Eleven negro and 648 native white farm operators ceased farming between 1909 and 1919. Five hundred and two foreign-born white operators partially took their place. Over 2,000 farm operators left the land in the next five years. Lancaster, with a gain of 5 2/10 per cent was the only county that increased its farm operators during the last fifteen years. Delaware, on the other hand, lost over 36 per cent of its farm operators.

This decrease is due to the decrease in farm lands[41] throughout the area. A similar situation exists in the agricultural regions of the State and Nation. It appears that too much land is being farmed at present. It means the actual abandonment of a considerable number of farms in the poorer districts. Other factors that apply especially to parts of this region are (1) the combining of small farms into ones of a more profitable size; (2) the conversion of farms into suburban sites in the vicinity of the large cities. The latter condition prevails in Delaware County particularly. Its farm loss amounted to 45.8 per cent in 25 years. The greatest decrease

[41] Farmland in 1900 (2,522,511 acres); in 1924 (2,244,223 acres). Decrease 11.03 per cent. Farmland in 1919 (2,425,042 acres). Decrease 3.89 per cent (1900-1919).

came in the last five years (1920-25). Montgomery County farms decreased 28 per cent in the same period. This taking of farms for building sites is evident from a casual survey of building construction throughout the region. Outside the suburban zone the greatest losses came in the rough crystalline uplands. In Chester County the farms decreased 15 per cent. Bucks County of the Triassic lowlands decreased 8 per cent, while Lancaster County increased its farms 16 per cent. Farm population[42] decreased in approximately the same proportion. Delaware County, with its farming conditions slightly different from the usual county of the uplands, is influenced by two factors: physical condition and urban growth. Philadelphia is stretching out like an octopus into Delaware County. Land not being utilized at present for building sites is in many places kept from being farmed by the possibility of being so used. Large profits can be made through purchase and sale of the land, but this makes farming almost impossible. Much land along the Delaware, the so-called marsh land, helps to reduce the total farm acreage. Industry also has crowded out farming along the river. Building construction, land speculation, war-time deflation and general agricultural depression have taken annually (1920-25) from the agricultural business of Delaware County many acres of the best farm land. Only 45 per cent of its land area is at present in farms, as compared to 79.5 per cent in Chester County.

Good Land vs. Poor Land.—In a county analysis[43] lowlands appear to be superior to uplands for farming purposes, and the limestone plain the best place of all. A still further analysis shows that in Lancaster County ten townships of the limestone belt have 96 per cent of their area in farms. This is much higher than the best ten townships of the Triassic lowlands or crystalline uplands.[44]

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[42] Delaware County lost 36, Montgomery 17, Chester 7, York 6½, Adams 5 and Bucks 3 per cent (1900-25).

[43] County Analysis—Percentage of the land area in farms: Rough Uplands—Adams 82, Chester 79.5. Triassic Lowlands—Bucks 86. Limestone Plains—Lancaster 92 (1919).

[44] Percentage of Township Lands in Farms, Lancaster County (1925); Crystalline Uplands, 83; Townships: Colerain, Conestoga, Drumore, East Drumore, Fulton, Little Britain, Martic, Providence, Sadsbury, Salisbury. Northern Mixed Soil Region, 89; Townships: Brecknock, Clay, Conoy, East Cocalico, West Cocalico, Elizabeth, Mt. Joy, Penn, Rapho, West Donegal. Limestone Plains, 96; Townships: Manor, West Lampeter, Leacock, Upper Leacock, West Earl, East Earl, Mannheim, East Hempfield, East Lampeter.

Limestone again shows up favorably in the consideration of the non-borough population of the same group of townships in relation to area. In the limestone country there are 5.01 acres for each person. This increases to 8.15 acres in the Triassic region and 11.23 acres in the crystalline uplands. Farmers demand on the average only 36 acres on which to make a living in the limestone belt. This amount increases to 44 acres in the mixed soil area of the north and to 67 acres in the crystalline uplands of the south. (All three regions are located in Lancaster County.) In ten townships located in the Triassic lowland region of Bucks County, the farmers found it necessary to have 56 acres to farm.

Improved Land.—In this region approximately 84 per cent of the farm land is improved (Table 24). This is over 4 per cent higher than the State average. Improved land is actually, although not relatively, decreasing. Industrial and suburban development takes no consideration of the value of land for farming purposes, consequently the greatest decrease relatively has been in Delaware County. The ratio of improved land to farm land is greater in the more level areas. It is lowest in the rough lands of Adams County. There the percentage is 78. It is also low in the crystalline uplands.

TABLE 24—LAND CONDITIONS (1925). (Nearest whole number, Acres)

County	Farm Land	Crop Land and Percentage of Farm Land		Pasture Land and Percentage of Farm Land		Woodland and Percentage of Farm Land	
Adams	268,000	190,000	70%	33,000	12%	36,000	14%
Bucks	307,000	225,000	73%	39,000	13%	32,000	10%
Chester	395,000	254,000	65%	76,000	19%	44,000	11%
Delaware	53,000	31,000	59%	13,000	25%	5,000	09%
Lancaster	521,000	394,000	75%	63,000	12%	40,000	08%
Montgomery	204,000	160,000	80%	22,000	11%	14,000	07%
York	494,000	344,000	69%	48,000	10%	77,000	16%
Total	2,242,000	1,598,000	69%	324,000	14%	248,000	11%

The plain areas of Lancaster, Bucks and Montgomery counties are high. Their ratio is approximately 85 per cent. A reverse ratio is assured when pasture land and woodland together are considered. The pastures and woodlands are usually in the hills or uplands.

This is true here as well as elsewhere. The fact that Adams County has 70 per cent of its farm area in crops as compared to 65 per cent in Chester County and 59 per cent in Delaware County is not entirely a matter of soil and relief. The possibilities for dairying are greater in the latter two counties. Dairying demands pasture. Delaware County has almost twice the percentage of pasture land as has Adams, while Chester County has more than half again as much. Adams County is the banner timber county of the entire region. Its proportion has been lowered because most of its valuable timber lands have been taken over for forest preserves and are no longer farmed. York County has the largest farm woodland acreage. Of the two regions of slight relief, *i. e.*, the Lancaster limestone plain and the Bucks County sandstone and shale lowland, the former has a larger percentage of its farm area in crops. The percentage is 78 to 74. The latter has the larger percentage of pasture land and woodland. Pasture land is greater by 4½ per cent and woodland is 7 per cent larger.[45] This appears to be a matter of soil rather than topography. The differences in surface conditions of the twenty townships are slight. There is very little waste land in either area.

Accessibility to Markets.—A good measure of the value of agricultural land in a given region is its selling price. Accessibility to markets is usually considered the most important factor in fixing this selling price (Fig. 5). The larger the market the greater should be the influence exerted. Philadelphia is the largest market to be considered. Nearness to Philadelphia increases the value of farm land adjacent,[46] to a point far above its real farm value.

[45] Selected townships in the limestone belt of Lancaster County (Page 81)—area 138,400 acres, farm acreage 133,083, crop land 103,742 acres, pasture land 11,229 acres, woodland 2,271 acres, acres per farmer 36 (January 1, 1925).

Selected townships in the Triassic lowland of Bucks County: Bedminster, Doylestown, Buckingham, Plumsted, New Britain, Solebury, Warrington, Warminster, Warwick and Wrightstown—farm acres 110,934, farm population 1,975, crop land 82,091 acres, pasture land 14,624 acres, woodland 10,370 acres (1925).

Percentage of farmland: In the limestone belt—Woodland .017, pasture land .085. In the sandstone and shale belt (Triassic)—Woodland .09, Pasture land .13 (1925).

[46] Suburban townships in Delaware County near Philadelphia: Upper Darby, Radnor, Haverford, Marple, Springfield, Newtown, Upper Providence, Nether Providence (1925)—farm acreage 12,256, total value $4,938,830, acreage value $403.

The value of land of the same topographic and soil conditions is also determined by nearness to market. This statement was made possible by a comparison of thirty townships[47] in the crystalline uplands. The difference in acreage value between the best located and most poorly located areas was $134. It was further verified by comparing the sandstone lowlands of Bucks County[48] with similar lowlands in the Schuylkill Valley of Chester County.[49] The difference in acreage value in this case equaled $34.

Topography lessens sometimes, and at times increases, land value in spite of superior market facilities. The Chester Valley townships[50] have some excellent land in the limestone valley, but also contain much inferior land in the neighboring hills. The land value is only $151. Nearness to a large city helps to increase the value of the coastal plain land of this region. If location and excellent transportation were the sole determining factors, these townships should contain the most valuable agricultural land. They average in Delaware County $375 to the acre. This is less by $30 than the value of the rough crystalline uplands adjacent to the city of Philadelphia. Ruggedness in the latter case is an attractive feature in the eyes of the home-builder, the golfer and the country gentleman.

Excellent soil and favorable topography at times are more important factors in this area than nearness to Philadelphia. Of

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[47] Thirty townships in the crystalline uplands: Lancaster County, ten townships previously cited, acreage value $112, acreage 139,739, farm value $15,683,389, acres per farmer 67, total area 156,226 acres. Chester County, twenty townships, ten townships near Kennett Square, namely, Kennett, New Garden, Pennsbury, East Marlboro, London Grove, Penn, Londonderry, Newlin, Pocopson, East Bradford—acreage 60,322, total value $10,680,210, acreage value $177; ten townships near Westchester: West Goshen, East Goshen, Westtown, Thornbury, Radnor, Newton, Thornbury, Middletown, Edgemont, Concord (the last six townships in Delaware County)—acreage 42,260, value $10,398,820, acreage value $246.

[48] Townships considered previously cited: Total farm area 110,934 acres, total value $14,503,179, acreage value $131.

[49] Schuylkill Valley townships: North Coventry, South Coventry, East Coventry, East Vincent, East Pikeland, Schuylkill—farm area 40,263, total value $6,663,790, acreage value $165.

[50] Chester Valley townships: Tredyffrin, Whiteland, West Whiteland, East Caln, Caln, Valley, Sadsbury, West Sadsbury (Chester County), Bart (Lancaster County)—total acreage 62,338, total value $9,420,576, acreage value $151.

these the most important appears to be soil, although topography and soil are difficult to separate. The limestone lands are not so accessible as the coastal plain lands of Bucks County, or the crys-

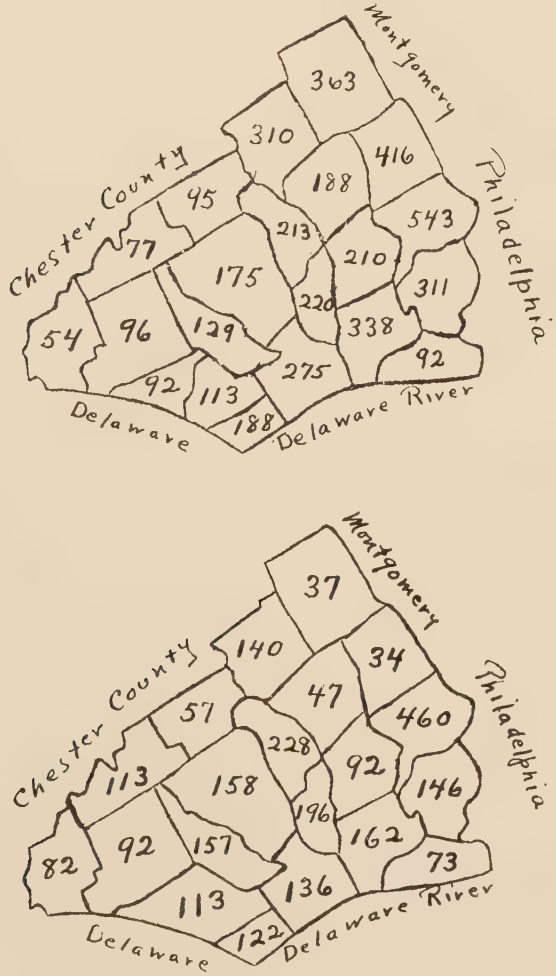

Fig. 5.—Value of Farm Lands and Buildings, Delaware County, 1925
Upper, Farm Lands per Acre; Lower, Farm Buildings per Acre

talline uplands near Westchester or Kennett Square or the sandstone lowlands of the Schuylkill Valley in Chester County. They have but a slight advantage over the Bucks County sandstone and

shale lowlands. All these are sections where agriculture is practiced on a rather extensive acreage. Two regions, namely, the coastal plains of Bucks County and the Schuylkill Valley in Chester County, have in their midst a heavy industrial development. The limestone of Lancaster County is worth $253 per acre. This land is more valuable than the land in any of the other above-mentioned regions.

There is a wide variation in land values in this region. In Lancaster County the crystalline uplands[51] have the poorest facilities for marketing. The land is, therefore, valued at only $112, as compared with a $149 acreage value of the mixed but predominantly sandstone area of the north.[52] In Chester County conditions are varied. There is a difference of well over $200 an acre between the best and the poorest farm land. Variations in land value are also noticeable in Delaware County. They are largely the result of location relative to Philadelphia, although soil and topography play an important part. Tinicum Township (Delaware County) agricultural land is low in price in comparison with that of adjacent townships. It is made up almost entirely of the overflow lands of the Delaware River. Its swampy nature makes drainage a vital problem. On the average, taking everything into consideration, the crystalline uplands[53] are worth slightly more than the sandstone lowlands. The range of value in the sandstone lands is a great deal less. The crystalline lands range from $246 to less than $60 per acre.

Among the counties, Delaware has the highest priced farm land. Its land averaged $286 an acre (1925). Adams County land is the least valuable. Its average value is $66. This is the result of position and topography. About 10 per cent of Adams County is located within the borders of South Mountain. The trap ridges, such as Cemetery Ridge and Big Round Top of Civil War fame, further reduce the land value. These ridges cover about 14 per cent[54] of the county area. Delaware County lands are handicapped by no such impediments to agriculture, and besides are more favor-

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[51] Ten townships considered. Crystalline—acreage 139,711, total value $15,683,389, acreage value $112. Lancaster County.

[52] Ten townships considered. Triassic Lowlands—acreage 136,358, total value $20,410,379, acreage value $149. Lancaster County.

[53] Only the counties of Bucks, Chester and Lancaster considered.

[54] U. S. Department of Agriculture, Soil Survey, Adams County.

ably located. Montgomery County farm land is valued at $197 an acre. All types of land are represented in this county. The crystalline uplands cover about 15.5 per cent, the Chester Valley 4.5 per cent, the Triassic lowlands 75.5 per cent, and the trap ridges

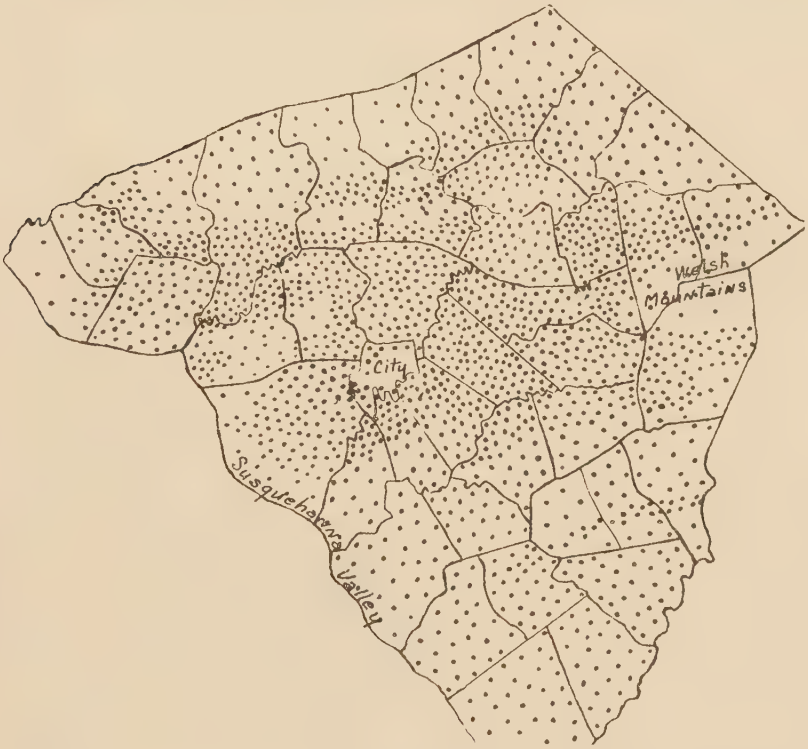

FIG. 6.—VALUE OF LAND AND BUILDINGS, LANCASTER COUNTY
. = $50,000

The number of dots in each township is correct according to figures taken from the United States Census returns of 1925. In locating the dots, the author took into consideration topographic and cultural conditions. Not all the townships were surveyed, consequently an approximate location of the dots could only be arrived at. The map shows clearly the superior value of the limestone lands.

approximately 4 per cent of the area of the county.[55] Land value here no doubt is increased by propinquity to Philadelphia and the Schuylkill Valley industrial region.

[55] *Ibid.*, Montgomery County.

When land is valued for its agriculture alone, soil, we found before, is the predominant factor. The limestone soil has added a greater value to Lancaster County land than the sandstone soil has to Bucks County land. Lancaster County farm land has an aver-

FIG. 7.—WOODLAND, LANCASTER COUNTY
.=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots has been only approximated. The map shows clearly the absence of woodland in the best agricultural areas.

age value of $175 as compared to a $125 acreage value in Bucks County. The crystalline soils of Chester County appear again to be slightly superior to the sandstones of Bucks County. The former land is valued at $135 an acre. York County values its land at $84 an acre. The topographic range of its lands is somewhat

similar to that of Montgomery County. It lacks, however, the position of the latter county. Limestone lands in this region appear to be the only agricultural lands that can be high in price and still be some distance removed from the largest markets. Land in this entire region[56] had in 1920 an average acreage value of $187. Iowa farm land in the same year was valued at $192. Soil and topography in Iowa are on the whole more favorable, but the lands of Iowa are exceedingly remote in comparison with the farm lands here.

Farm Income[57]

An examination of farm income (Table 25) indicates that on the small average farm (49.1 acres) of Lancaster County the annual income of $2,972 is superior to the average income elsewhere. The average farm outside of Lancaster County has an acreage of 65.2, and an income of $2,467 per year. Acreage income value in Lancaster County of $60.40 is much superior to the $37.40 acreage income value elsewhere. The crystalline area of Chester and Delaware counties has a farm income value of $2,296, as compared to $1,948, the average income value of Montgomery and Bucks coun-

Table 25.—Farm Income (1919)

County	Total	Each Farm	Each Acre	Farm Acres
Adams	$11,644,699	$3,374	$41.7	80.9
Bucks	11,182,183	1,957	33.7	58.2
Chester	16,372,012	2,972	38.6	77.0
Delaware	2,096,153	1,660	27.5	58.9
Lancaster	33,604,053	2,972	60.4	49.1
Montgomery	9,392,477	1,940	38.3	50.6
York	22,996,899	2,941	44.7	65.7

[56] Seven counties—total acreage 2,424,592, total value $452,719,534, acreage value $187 (1920).

[57] Farm Income—Value of all crops, dairy products, poultry products, 1/10 the value of the livestock, in order to represent roughly the value of the new animals raised each year in excess of the value of their food, 1/10 the value of the beef animals less the amounts spent for labor, fertilizer and feed.

ties combined. The two latter counties are chiefly in the sandstone and shale lowland belt. This difference appears to be due to the fact that the farms are larger in the crystalline. The income per acre shows a return greater in the sandstone and shale counties by $3 per acre. The acreage return is $36, as compared to $33. Poor soil balances unfavorable topography.

Rich and fertile Lancaster County is able to support a family as well on a small acreage as other counties can on a larger farm. In this respect it is the exception. The three counties of Bucks, Delaware and Montgomery have average farms of less than sixty acres. Their farm income is also less than $2,000. Chester and York counties have an average farm acreage of over 70 acres (71.3). Their average farm income is $2,956. In Lancaster County 38 per cent of the farms are under 20 acres. Under the circumstances its returns per farm are exceptional. Only 28.8 per cent of the farms of Chester County are so small, and the farm income return is exactly the same ($2,972). In all the counties, farms are usually too small for the best results. More managerial ability is required on small farms of the intensive types than on large farms that are farmed extensively. Adjustments come more slowly. Only the efficient can prosper. A survey made by the U. S. Department of Agriculture[58] in 1915 reveals some of the reasons why it is easier to make a satisfactory income on a large farm than on a small one (Chester County): (1) Farms of less than 40 acres are too small to give a man profitable employment for a sufficient number of days each year. Therefore, he does not get a good yearly income unless he is a man of unusual ability. He must usually supplement his income by work elsewhere. (2) The same is true of horse labor. (3) It is easier for the farmer to find profitable work for himself and his help on the larger farm, and he can provide work for his help for a longer period of time. (4) The cost of labor per acre of crops grown on the smaller farm is high. The larger the farm the more the farmer can afford to pay in wages. (5) More machinery per acre of crops is needed on the small farm. (6) Overhead cost in farm buildings is likewise very much higher relatively on the small farms.

[58] U. S. Dept. of Agriculture, Bulletin No. 341, Jan. 17, 1916. (An excellent series of tables is included in this report. These tables show (1) Relation of size of farm to efficient use of Labor and Working Capital (Chester County); (2) Relation of size of farm to Labor Income (Chester County).

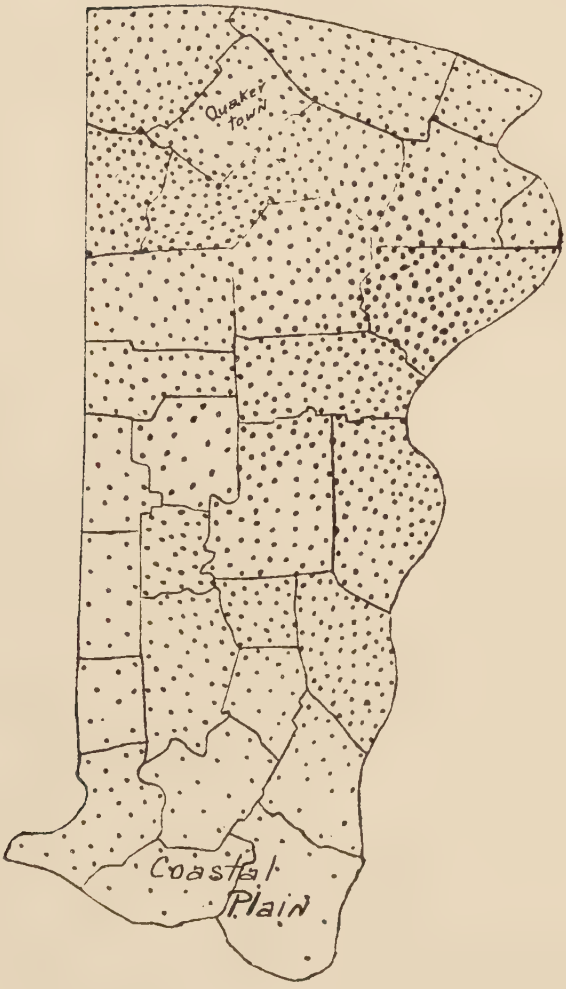

FIG. 8.—WOODLAND, BUCKS COUNTY
• = 25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots has been only approximated. The absence of woodland in south and western Bucks County is largely a matter of propinquity to extensive suburban and industrial developments.

Farm incomes[59] in this region in 1919 as compared with agriculture incomes elsewhere throughout selected regions of the United States were as follows:

State	Good Land Income	Poor Land Income
Iowa	$5,945	$3,480
Illinois	5,710	1,760
Minnesota	3,860	1,740
Ohio	3,830	2,180
Indiana	3,460	1,625
Georgia	2,200	805
Kentucky	1,910	785
Arkansas	1,810	1,090
Tennessee	1,745	1,155
Mississippi	1,317	1,010
Pennsylvania Piedmont	2,972[60]	2,407[61]

Farm acreage is higher in the first three States than it is in this region. On the good land, Illinois farms averaged 164 acres, Iowa farms 174 acres, and Minnesota farms 184 acres. The acreage of the poor land farms was 112, 151 and 154. Good land of the Pennsylvania area averages 49.1 acres per farm, poor land 65.2. The farms here are superior, however, on the return per acre. Good land in Iowa, Illinois and Minnesota had acreage incomes of $34, $34 and $21. The good land of Lancaster County brings in $60.40 acreage income. All land in this region, except in Delaware County, has a higher acreage return than the best lands of Iowa or Illinois. Delaware County lands with their acreage income return of $27.50 are better than the best land of Minnesota. This Minnesota land averages $21 per acre as an annual income. Poor land in Iowa produced an acreage income of $23, as compared with $16 in Illinois and $18 in Minnesota. The acreage income returns are higher here[62] than on any farm land of the first three States.

Ownership and Tenancy.—In making an analysis of tenancy in the United States, Ellsworth Huntington came to the conclusion

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[59] Huntington, Ellsworth: "Good Land vs. Poor Land," *Economic Geography*, Vol. II, No. 3, July, 1926, p. 337. (Farm incomes here obtained by using the same measuring stick except 1/10 the value of the beef animals was added in this region, but the wool value was omitted. In Lancaster County it made a difference of less than 50 cents per acre.

[60] Lancaster County.

[61] Average income of Adams, Bucks, Chester, Delaware, Montgomery, York.

[62] Table 25. Farm Income (1919).

that, with the exception of the negro farmers of Tennessee, the percentage of farmers who operate their own farms is very much smaller on good land than on poor land. He suggests that on good land the reasons for tenancy are: (1) Some farmers save enough

FIG. 9.—WOODLAND, CHESTER COUNTY
.=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots has been only approximated. The absence of woodland in the Chester and Schuylkill valleys is a noticeable condition. These valleys are industrially the best-developed sections of Chester County.

so that they can afford to rent their farms and retire; (2) some farmers prosper so much that they buy farms in addition to their own, and rent one of the farms; (3) good land is always in demand; (4) ability of young people to move to the towns from the good land, more so than from the poor land. Farms are frequently

inherited, then rented, and the money used in establishing the owner in business elsewhere.

The conditions in this region bear out this country analysis in many respects. Ownership operation is still the principal type of farm management in every county (Table 26). It is, however, less in Lancaster County than elsewhere. Only 58.4 per cent of the farms of that county are so operated. The highest percentage of ownership is in Montgomery County (90). Bucks County, a second predominantly sandstone area, is also high (87). The farms of these two counties are small in acreage and low in price. Tenants are also numerous in the good land of Lancaster County and few in the poor lands of the counties of Bucks and Montgomery.

TABLE 26.—MANAGEMENT OF FARMS IN SOUTHEASTERN PENNSYLVANIA. PERCENTAGE 1920 AND 1925

County	Owner		Tenant		Manager	
	1920	1925	1920	1925	1920	1925
Adams	69.8	74.0	27.7	22.0	4.5	4.0
Bucks	79.5	87.0	17.1	11.8	3.4	1.2
Chester	70.7	79.9	23.8	17.7	5.5	2.4
Delaware	59.4	76.5	29.9	17.8	10.7	5.7
Lancaster	57.0	58.4	41.1	41.2	1.9	0.4
Montgomery	75.7	90.0	17.3	9.0	7.0	1.0
York	69.5	77.3	28.6	21.6	1.9	1.1

It has also been found in the ten limestone townships formerly considered that the percentage of tenancy (Lancaster County) was 5.2 higher than in the county at large. These townships include the best land of this entire region. Over forty counties of Illinois have a higher percentage of tenancy. In contrast the ten townships of the sandstone and shale lowlands of Bucks County have the small tenancy percentage of 13.6. No county of Illinois has a percentage of less than 21. The former percentage (13.6) is higher than the county percentage by 1.8[63]

[63] 1924 tenantry percentage—Lancaster 41.2, Bucks 11.8, Adams 22, Chester 17.8, Delaware 17.8, Montgomery 9, and York 21.6.

Bulletin 341, U. S. Department of Agriculture, p. 68. Highest percentage of tenantry (1910) in Chester County was found among farms of over 160 acres (41).

Foreign-born farmers, both owners and tenants, are proportionately larger in number in Bucks and Montgomery counties than elsewhere throughout the region. Negro farmers are few in number everywhere, but in Bucks County they are proportionately larger in number than anywhere, except Chester County. It appears to be a matter of the undesirability of land.

Tenantry is decreasing in every county except Lancaster (1919-24). Here the increase was 1/10. The greatest decrease came in Delaware County where a 12.1 slump was recorded. Montgomery was next with an 8.3 decrease. In these counties uncertainty of tenure due to the passing of farm land into suburban tracts was one of the possible causes of decrease. Good tenants desire permanency and good land. Neither the best land nor the greatest degree of permanency can be had in either county. Other counties experienced a percentage decrease in tenantry in the following order: York 7, Chester 6.1, Adams 5.7, and Bucks 5.3. Tenantry has decreased actually as well as relatively in all the territory except Lancaster County, where tenants increased from 4,647 to 4,721 in the period 1919-24. Managerial farm operation is decreasing everywhere, after a sudden increase during the war period. This sudden decrease in tenantry and farm managers illustrates the fact that farming is not so desirable here during this after-war period of agricultural depression. It appears that only in the best agricultural lands of the area are conditions favorable for farm operation. Even in Lancaster County the increase in tenantry has been halted, although it has not been entirely stopped.

Form of Tenancy (Table 27): In this region the share tenants are in the majority, being twice as common as all other forms. Over 79 per cent are of the share form in Lancaster County and 13 per cent are cash tenants. Adams and York as well as Lancaster tenants are predominantly of the share type. Both of the latter counties have 86 per cent. Chester County leans toward the share group with 48 per cent. Bucks has 40.4 per cent in the share class, Montgomery 18, and Delaware 8. The last three counties have proportionately the largest group of cash tenants. In Lancaster County, among the Pennsylvania Dutch, the son is frequently his father's tenant. These people are clannish. They want to keep the land in the family or the group. A native son of poor parents may be given the first opportunity. In either case the transaction is more likely to be on the share than on the cash basis. The lime-

stone lands of Lancaster County do not appear to be diminishing in fertility on account of tenant farmers. A farmer in Lancaster County spends approximately $3 per acre for fertilizer each year. Although this is not the highest amount paid out per acre for fertilizer[64] in this region, only three counties surpass, namely, Bucks, Montgomery and Delaware. The two former counties, Bucks and Montgomery, spend only ten cents per acre more. Delaware County farmers spend $3.50 per acre for fertilizer. We must consider, however, that Lancaster County animals have a very high value per acre.[65] These animals are very frequently stall fed in Lancaster County, for the pasture land area is only 12 per cent of the farm land. Only in Montgomery and York counties[66] is it lower than this. In Delaware County it is 25 per cent. Both of these conditions indicate a home supply of manure in Lancaster County in addition to the fertilizer purchased. This would probably bring the application of fertilizer per acre up at least to that of Delaware County and probably above the rest.

TABLE 27.—FORM OF TENANCY IN SOUTHEASTERN PENNSYLVANIA (1919)

County	Cash	Share Cash	Share	Unclassified
Adams	829	9	118	—
Bucks	395	11	572	—
Chester	632	24	590	67
Delaware	30	3	329	23
Lancaster	3,680	267	600	100
Montgomery	149	5	661	22
York	1,921	14	195	107
Total	7,636	323	3,065	319

Farm Mortgage Conditions.—Only those farms that are operated by owners are included in this consideration of mortgage conditions. Lancaster County has 52 per cent of these farms free of

[64] Amounts spent for fertilizer (1919): Adams $1.60, Bucks $3.10, Chester $2.80, Delaware $3.50, Montgomery $3.10, York $2.45, Lancaster $3.00.

[65] Animal value per acre: Adams $15.6, Bucks $20.7, Delaware $35, Lancaster $30, Montgomery $23, York $20. Only farms that reported are considered.

[66] Table 24.

mortgage. In only two counties, Adams and York, are mortgage conditions more favorable. York County with 36.1 per cent ratio of debt to value as compared to Lancaster County, 34.9, and Adams 34.2, lowers its favorable position somewhat. The other counties are grouped between 43 and 46 per cent of the farms that are mortgaged. Delaware County, with the highest land values, has the lowest ratio (28.5) of debt to value. Bucks County in this respect is high, with 38.1. The excellent limestone land of Lancaster County has a most favorable condition relative to mortgages, better than the crystalline uplands of Chester or the sandstone and shale lowlands of Bucks and Montgomery. Interest rates on mortgages are also the lowest in Lancaster County (4.6 per cent). The stronger the investment, the less the rate. Excellent land and a reputation as good and honest farmers have made possible this condition. The other counties vary between 5 and 5½ per cent. Little difference can be noted between the crystalline uplands and the Triassic lowlands in respect to interest rates. They are on the average higher in Illinois than they are here. No county in Illinois has a rate less than 5 per cent. The best counties are between 5 and 5½ and the poorest counties over 6. Nearness to capital supplies is slightly more favorable in this region, and certainty of agricultural returns keeps interest rates low.

A further study of present farming conditions will be continued under the heading of agricultural crops.

VII. AGRICULTURAL CROPS

Southeastern Pennsylvania is a region of diversified farming. Only a few farmers depend entirely on one crop. The principal crops (Table 28) are hay, corn, wheat and oats. Special products raised here are tobacco, mostly in Lancaster County, apples in Adams County, mushrooms, chiefly in Chester County, potatoes well scattered but principally in York, and nursery products.

Hay.—In acreage hay is the most important of the farm crops in every county. It is also an important crop with those who do not keep dairies or beef animals. Hay when sold off the farm is baled and sold to local buyers and commission men. The 1924 production amounted to 714,725 tons or 1.4 tons per acre. Hay production is increasing in every county with the exception of Delaware. Even in Delaware County there has been a proportionate increase, for the farm acreage decreased approximately 30 per cent in the first five years of the present decade, while hay land decreased by only 301 acres.

Natural conditions for hay production are just as favorable in Illinois, but hay production is less important relatively. This is not, however, one of the leading hay producing regions of the country. Conditions that favor hay production are: (1) high prices; hay when sold direct from the farms in the east always brings a higher price than it does in Illinois; (2) usefulness as feed; (3) small labor requirement; (4) ample rainfall; (5) large areas of hilly land unsuited for satisfactory crop production.

This region produces on the average about 19 per cent of the State output on 17 per cent of the State hay land. Seven counties of Southeastern Wisconsin[1] are compared as hay producers with this area in Table 29.

The farms of this region are on the average too small to make hay culture successful as a one-crop type. Hay has, however, a short seasonal demand for labor. This condition, together with its value for feed, makes hay important here in the rotation system of the year. It is also important in the crop rotations from year to

[1] Southeastern Wisconsin selected for a comparative study because of its similarity of development with the region under discussion.

TABLE 28.—CROP ACREAGE AND PERCENTAGE OF CROP LAND, 1924

County	Crops								
	Hay		Corn		Wheat		Oats		Other Crops
	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage	Acreage	Percentage	Percentage
Adams	58,899	.31	35,704	.18	43,985	.23	11,942	.06	.22
Bucks	88,143	.39	40,908	.19	26,607	.12	20,177	.09	.21
Chester	95,424	.37	53,796	.21	35,674	.14	22,521	.09	.19
Delaware	12,178	.40	6,606	.21	2,272	.07	1,725	.06	.26
Lancaster	110,868	.30	82,481	.21	101,640	.26	15,327	.04	.19
Montgomery	61,495	.40	29,782	.19	19,952	.13	12,538	.08	.20
York	94,353	.28	72,678	.21	87,690	.25	25,975	.08	.18
Total	521,360	Av. .35	321,955	Av. .20	317,820	Av. .17	110,205	Av. .07	Av. 21

TABLE 29.—COMPARATIVE STUDY OF HAY PRODUCTION IN SOUTHEASTERN PENNSYLVANIA AND SOUTHEASTERN WISCONSIN (1924)

Area	Acreage	Tons	Tons per Acre	Percentage of land in hay	
				Farmland	Cropland
Pennsylvania	521,360	714,725	1.39	23	35
Wisconsin	375,385	716,158	1.90	18	30

year. Large farms raise[2] a greater proportion of hay than is raised on the smaller units. Lancaster County, the area of small farms, had only 30 per cent of its crop area in hay in 1924. This valuable land of the small farms must all be utilized for crops that provide more days' work per acre. In Adams and York counties the low percentage of hay land appears to be due to two factors, both relating to the demand for hay. Dairying is of least importance in these two counties, and distance from market is greater. Delaware County, with 40 per cent of its crop area in hay, has the best market facilities. Hay is a bulky product and consequently must be produced close to market. Montgomery County, in practically the same position as Delaware, but with a different type of soil, also has 40 per cent of its crop land in hay.

There are other factors that influence hay production. In Chester County (Fig. 10) the serpentine soils of Elk and the two Nottingham townships prevent satisfactory acreage yields. The rough and stony land of West Caln Township and the rough elevated lands of the extreme western part of Chester County cause production to diminish relatively. The Chester Valley townships would be outstanding producers if so much of their territory were not occupied by hills and industrial commercial developments. The only townships in Bucks County that produced in 1924 less than one ton of hay to the acre were Haycock, East and West Rockhill. These areas are all located in the northern mixed and rough soil lands of the county. Durham Township of the same region produced 1.3 tons to the acre. This township is improved agriculturally by the famous limestone Durham Valley. Coastal plain soils

[2] A condition noticed in Chester County also by the U. S. Department of Agriculture, Bulletin No. 341, pp. 75, 76.

are good hay soils. Their production of 1.45 tons to the acre in Bucks County slightly exceeds the average of the sandstone and shale lowlands (1.32).[3] They have, however, only 35 per cent of their crop land in hay, as compared to 42 per cent in the Triassic

FIG. 10.—HAY, CHESTER AND DELAWARE COUNTIES
. = 100 tons

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. The concentration of hay production in southwestern Chester County is noticeable as are the regions of sparse production, namely, the North and South Valley Hills, where rough topography handicaps; the Octorara Valley, an outstanding pasture area; the Serpentine Barrens a region of poor soils; and the region adjacent to Philadelphia, where suburban and industrial developments interfere.

lowlands of the central part of the county. The land of the coastal plain appears to be proportionately more valuable for other crops,

[3] Townships considered in Bucks County: Bedminster, Buckingham, Doylestown, New Britain and Newtown—acreage 18,636; production 24,566 tons.

such as vegetables and potatoes. This is true also of Delaware County. Crystalline soils are slightly superior to the Triassic as the 1.4 tons per acre average in Chester County indicates.

Wheat.—This is the third crop of importance. It was grown on 321,955 acres in 1924. This was 20 per cent of the crop land, a percentage higher than the State average. It is of the soft, red, winter variety. Wheat production is increasing slowly in this region in proportion, but not in actual acreage sown. In 1880, wheat was found on 345,603 acres. Twenty years later the acreage had increased to 364,236. In the year 1919 the greatest crop acreage was sown. This was 395,977 acres. Wheat acreage in the last five years (1919-24) has declined because of a slump in the farming industry that affected the wheat growers particularly. The production per acre fluctuates between 15 and 20 bushels. Since 1880 it has averaged 17.5 bushels.[4]

Items	1879	1899	1919	1924
Acres	345,603	374,236	395,977	317,838
Production	5,676,971	5,601,780	6,879,837	6,205,953
Production per acre	17	15	18	20

Wheat alone is relatively not a highly profitable crop. It has its place, however. Wheat will furnish the farmer straw for bedding. It also gives him an opportunity for seeding the more important and more profitable hay crop. Farm labor, work animals and equipment that are necessary for other crops can be utilized for wheat in the slack season, for wheat here is primarily of the winter variety. Wheat rotated with a tilled crop is also desirable because the tilled crop helps to rid the land of weeds. The small farms of the region, the small profits in wheat per acre, and the competition of the larger western farms tend to keep wheat acreage down. Natural conditions are not entirely favorable but have little to do with the situation. Variations in weather conditions from year to year increase or decrease the yield per acre. Wet weather frequently makes for difficulty in harvesting. Many winters have alternate periods of freezing and thawing that are not the best for wheat. Early maturing varieties are necessary because the late kinds are likely to be damaged by rust. The rainfall is on the average too heavy. The largest yields are harvested when the annual precipitation is from 30 to 35 inches. Lower yields prevail when precipitation is either more or less.

[4] Census Data Showing Wheat Production, 1879-1924:

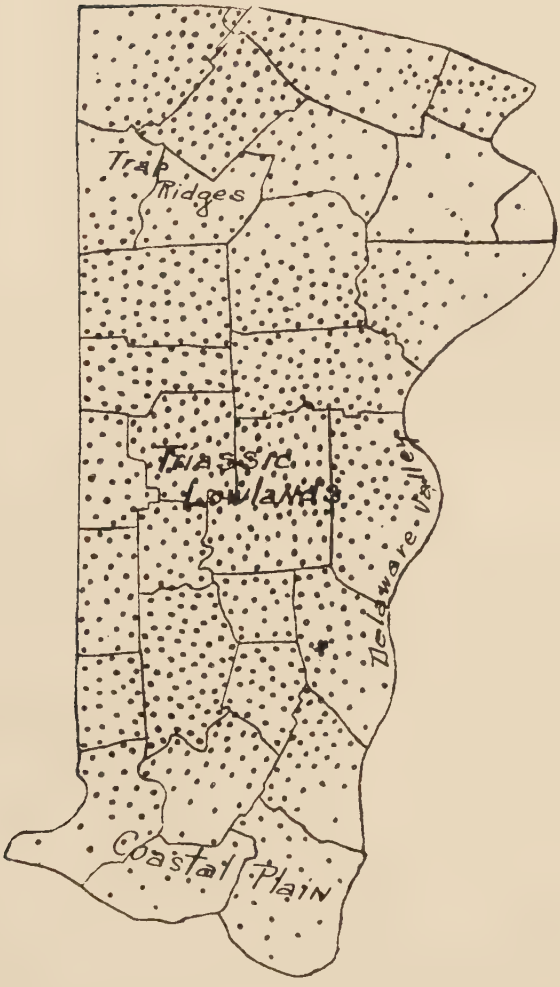

Fig. 11.—Wheat, Bucks County
.=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been approximated. Wheat is concentrated in the Triassic Lowlands, the area of subdued relief. Its production is lacking in the regions of severe relief, and it has only a minor place in the farm schedule of southern Bucks County. Soil conditions prevent Bucks County from becoming a heavy producer of wheat.

Lancaster County is the principal wheat county. The farmers there plant more acres, harvest more bushels, utilize for wheat a larger percentage of the crop land, and produce slightly more to the acre on a long-time average. The average production per acre

FIG. 12.—WHEAT, LANCASTER COUNTY
•=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. Lancaster County is the great wheat-producing county of southeastern Pennsylvania because of the large areas of limestone soil (compare with Fig. 11).

is also more consistent from year to year. It varies slightly between 19 and 22 bushels. The average acreage production of the entire region by separate counties shows Adams County to be the least important, preceded in order by York, Montgomery, Bucks, Chester, Delaware and Lancaster. The range is between 14.5 and

21 bushels per acre. Adams County farmers plant more wheat than the farmers of any other county except Lancaster and York (Table 28). It appears that two things are not favorable in Adams County: a predominance of sandstone soils in the best part of the county, and rough topography and stony land elsewhere.

Fig. 13.—Wheat, Chester and Delaware Counties
• = 1000 bushels

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. Wheat production is most important in the remote sections of Chester County. In this county it upholds its reputation as a frontier crop.

Nearness to market is not an important factor in wheat production. It lessens, on the whole, its importance. Adams and York counties, with their large areas in wheat, are the most remote of all the counties. Fig. 10 shows that one of the sections of Chester County least favorably located for markets is producing the largest wheat crop. Wheat always was a good frontier crop.

In Lancaster County wheat is a product chiefly of the limestone soil. The county average in 1924 was 21 bushels. Five townships[5] in the limestone region have an average acreage production of slightly less than 26 bushels. In Lancaster County, a difference of slightly less than two bushels to the acre exists between the crystalline and Triassic soils.[6] The production appears to favor the crystalline. Topographical influences can be seen on all three wheat acreage maps (Figs. 12, 13, 14), if they are compared with the associated topographic map (see previous chapter). Topographic conditions influence wheat production more than they do corn production, but the reverse is true in respect to soils.

This area is not one of the foremost winter wheat sections of the United States. In 1909 Pennsylvania ranked seventh in wheat production. At that time this region sowed approximately 30 per cent of the State acreage and harvested nearly 34 per cent of the product. In 1924 the acreage percentage was 28 with no noticeable change in the percentage of the total State production. Whitman, Washington, the first county in bushels harvested, produced approximately thirty bushels to the acre on the average. The Washington State average (1919-24) in bushels per acre was about 18. This area is about one-fourth as important as the State of Washington as a winter wheat producer.

Corn.—This is the second crop of importance in this region. It was important to the early settlers because: (1) acclimated seed was available, (2) it furnished food for both man and animals, and (3) it was the most adaptable and best yield crop for newly cleared land.[7] It is now almost as commonly grown as hay, taking up 20 per cent of the crop area. No county has less than 18 per cent or more than 21 per cent of its crop land in corn. The greatest acreage naturally is in Lancaster County. This is partly a matter of area, and the extensive development of its land for crops. Seventy-seven per cent of the farm land of the ten limestone townships in Lancaster County is in crops, as compared with the 74 per cent in the Triassic lowlands of Bucks County. The crystalline areas are much lower.

[5] Upper Leacock 26, Mannheim 27, West Earl 26, East Lampeter 24, Leacock 26.

[6] Triassic townships, Lancaster County: Brecknock 19, East Cocalico 21, Elizabeth 16, West Cocalico 18, Penn 21. Average 19.

[7] U. S. Department of Agriculture Year Book, 1921, p. 174.

Corn is more profitable to raise than wheat and is grown here mostly for feed. General conditions are better here for corn than in the State as a whole. The State averages 12 per cent of its crop area in corn and its lands yield about 34 bushels to the acre. The yield here is slightly more. Factors favorable for corn production

FIG. 14.—CORN ACREAGE, CHESTER AND DELAWARE COUNTIES
•=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. Corn acreage appears to be well distributed; only the regions of excessive relief, exceedingly poor soil and adjacent to Philadelphia are deficient.

are: (1) good market, (2) demand for food, (3) soil, and (4) climate. Hot, showery days in summer with a long growing season make ideal corn conditions. Corn, however, furnishes no profitable employment from July to late September. Rough and hilly lands also interfere in many places. Care must be taken to prevent soil wash, for corn cultivation makes for greater erosional activities. Figs. 15, 16 and 17, which represent corn acreage dis-

tribution throughout Lancaster, Chester and Bucks counties, indicate slight soil and topographic influences.

Limestone in this region makes the best corn soil. For highest and most profitable yields, corn requires a fertile, well-drained, loamy soil well supplied with humus that can be easily worked with labor-saving machinery.[8] The limestone in Lancaster County has all these characteristics. The limestone townships raise 54 bushels to the acre in contrast to the 44 bushels in the crystalline area and 35 bushels in the Bucks County sandstone and shale lowlands. Chester County averages 43 bushels and Delaware County 41.5 bushels to the acre. Adams County, with its large proportion of difficult topography, produces only 27 bushels to the acre. Much of the best area of Adams is also Triassic lowland. This helps to make it undesirable as a corn country. Bucks and Montgomery counties[9] indicate that the Triassic lowlands are not good corn country by producing 29 and 37 bushels to the acre, respectively. The topography is as favorable in Bucks County for corn as in any part of the area.

This is not one of the principal corn areas of the United States. The State of Illinois, the great corn State, has approximately nine million of its acres to corn.[10] The State of Pennsylvania plants slightly more than one million acres, of which this region has about 30 per cent. Illinois corn crop averages annually between three and four hundred million bushels. This amounts to seven or eight times the crop of Pennsylvania. Illinois in 1924 produced slightly more than 33 bushels to the acre. Its acreage yield varied between 30 and 40 bushels. It is a trifle less here.

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[8] U. S. Department of Agriculture Year Book, 1921, p. 181.

[9] Corn production and production per acre, 1924:

Adams	821,524	27
Bucks	1,119,031	29
Chester	1,917,996	43
Delaware	218,185	41.5
Lancaster	4,054,774	49
Montgomery	918,859	37
York	2,792,734	38
Total	11,843,103	

[10] Corn production in Illinois in 1924: Acreage 8,778,334, bushels 259,545,250. Corn production in Illinois in 1909: Acreage 10,045,839, bushels 390,218,676.

Small farms keep down the production here. In Illinois the corn-producing farmers plant on each farm about 40 acres of corn. Land is also rougher and the soil on the average is more thin and stony in this region. This condition tends to reduce the average

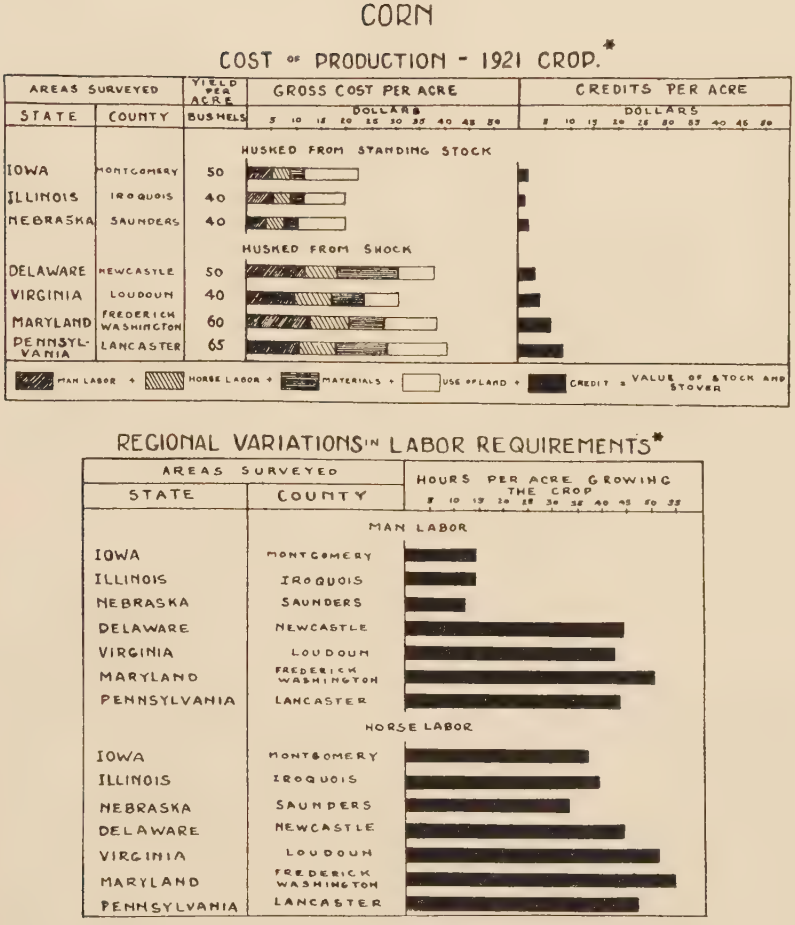
FIG. 15.—CORN, LANCASTER COUNTY
.=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. Corn acreage in Lancaster County is more widely distributed than wheat (compare with Fig. 12).

yield per acre. Lancaster County, in all census periods from 1900 to 1924, inclusive, has averaged over 49 bushels to the acre. No other county has such favorable soil and topography. The corn climate of this area is the equal of the Illinois climate.

FIG. 16.—CORN, BUCKS COUNTY
.=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. The Triassic Lowlands, as can be seen by the map, is not a good corn-producing region.



*NOTE: COMPILED FOR 1921 FROM BASIC REQUIREMENTS DETERMINED BY THE U.S. DEPARTMENT OF AGRICULTURE.

FIG. 17.—CORN PRODUCTION

An interesting study has been made of the cost of production per acre of the 1921 corn crop. The cost of producing an acre of corn varies from farm to farm and from State to State. This is usually the result of different practices. Some farmers husk the corn from standing stalks, others from the shock. The latter, which is very expensive, is a very common procedure in Lancaster County. Other cost factors arise from the nature of the field, its size, the size of the machinery and teams used, and the extent of rent and interest on land values. The situation is graphically shown in Fig. 18. Man, horse and material labor, especially the former, are much higher in Lancaster County than in any of the western States and counties. The small farms of Lancaster County are the most important reason for this. Other factors are the large production per acre and the high cost of labor. Because of the industrial positions open in the east, workers have a wider range of choice as to the nature of their work. In addition to the value of the corn, Lancaster County should have credit for about $8 per acre for the use it makes of corn shocks for feeding purposes. In the western States the stalks are used for pasture, which practice lowers their value considerably.

A difference is noticed in the cost of producing corn in the different counties. If credits are considered the cost is almost the same in each (Fig. 18). The larger production per acre in Lancaster County, however, makes it the most profitable corn-producing region. It appears that the Lancaster County farmers reap as large a return from their corn crop as do the farmers of the middle west, probably a larger one, for a smaller proportion of the corn moves out of the county than in most of the counties of the middle west. Only 9 per cent of the corn grown in Pennsylvania moved out of the county, as compared to 38 per cent in Illinois.[11] Prices are higher in Pennsylvania. On December 1, 1921,[12] corn was worth 55c per bushel on the average in Pennsylvania, as compared to 30c in Iowa, 38c in Illinois, 27c in Nebraska, 49c in Maryland, 45c in Delaware and 69c in Virginia.

Oats.—Southeastern Pennsylvania is not a good oat-producing region. Its average yield of 29 bushels per acre is small compared with other field crops when its nutriment content and its low

[11] U. S. Department of Agriculture Year Book (1921), p. 200.
[12] *Ibid.*, p. 110.

selling price are considered. It is not a profitable crop. The acreage production is higher here than in the State at large by about four bushels. It usually sows in the neighborhood of 11 per cent of the crop of the State and harvests from 11 to 14 per cent of the State crop (125,000 acres and 3,500,000 bushels in 1919). Oats acreage is about 7 per cent of the total crop land. This is small as compared with 35 for hay, 20 for corn and 17 for wheat (1924). Seven counties of Southeastern Wisconsin are compared as oats producers with this region in Table 30.

TABLE 30.—COMPARATIVE STUDY OF THE OATS PRODUCTION IN SOUTHEASTERN PENNSYLVANIA AND SOUTHEASTERN WISCONSIN (1924)

Area	Acreage	Bushels	Bushels per Acre	Percentage of Land	
				Farmland	Cropland
Pennsylvania	106,817	3,658,345	34.5	048	07
Wisconsin	289,219	11,271,959	39.8	14	23

Oats are decreasing in importance. All counties have decreased, York County the least of all (Table 31). Further decrease will probably result from more scientific and profitable farming. The only value of oats is for feed. The fact that it has a small value per acre with poor qualities as a nurse crop hinders its development. Climate is also unfavorable. The weather is likely to be too hot and humid at heading time. In this respect oats are similar to barley. They both require a cool summer, which favors the ripening of the grain.[13] Frequently the crop of oats is materially reduced when it is near maturity by a few hot days,[14] such as are likely to occur in this region. Owners of the small farms can ill afford to produce oats, an excellent but usually expensive horse feed. In 1909 the average value per acre in the Middle Atlantic States was $13.15. This was $3.65 per acre higher than in 1899. Wheat in the same period in the same group of States was worth $19.81, corn $21.05, and hay $15.31 an acre. These products also had a better record than oats in 1899.

[13] FINCH and BAKER, *Geography of the World's Agriculture*, pp. 35-37.
[14] SMITH, J. W., *Agricultural Meteorology*, p. 178.

TABLE 31.—CENSUS DATA SHOWING CHANGES IN OATS PRODUCTION (1839-1924), BUSHELS

County	1839	1859	1879	1899	1919	1924[15]
Adams	274,960	461,850	435,115	542,340	292,201	373,197
Bucks	884,870	1,198,027	1,208,369	688,480	711,369	632,117
Chester	1,079,745	1,145,712	1,137,089	925,070	690,523	808,312
Delaware	219,047	192,320	154,659	43,630	60,187	48,673
Lancaster	1,376,673	1,922,922	1,412,694	1,058,170	494,796	486,771
Montgomery	642,990	815,069	840,085	614,630	419,483	380,228
York	597,044	1,128,683	1,066,110	1,084,460	677,888	921,105

Rye.—This cereal has been called "the grain of poverty" on account of its ability to grow on soil too poor for successful wheat culture. It is in this region a product of the sandstone lowlands, for in 1919 over 57 per cent was grown in Bucks and Montgomery counties. In 1840 it competed with other cereals for the best land. It appears to be decreasing in importance (Table 32). Its ability to thrive and produce satisfactory yields in regions of severe winter temperature, poor soils, and rough topography will tend to keep it away from the better lands. The region produced in 1924, 273,421 bushels or 16 per cent of the State's output. The percentage was approximately the same in 1919. The value of rye is for its straw, which is longer and tougher than that of wheat or oats. It is

TABLE 32.—CENSUS DATA SHOWING CHANGES IN RYE PRODUCTION, 1839-1924

County	1839	1859	1879	1899	1919	1924[15]
Adams	88,561	53,408	39,867	85,780	64,000	28,305
Bucks	255,666	206,217	159,899	227,850	182,000	109,792
Chester	86,147	32,084	19,694	21,560	20,000	9,676
Delaware	3,359	5,573	7,818	5,170	2,000	823
Lancaster	448,710	97,001	77,818	65,100	37,000	17,388
Montgomery	275,069	263,392	194,636	199,380	130,000	54,320
York	363,886	216,782	141,052	265,850	109,000	53,117

[15] The year 1924 was an excellent oats year in Southeastern Pennsylvania. The acreage planted in 1924 was over 25,000 less than was planted in 1919. A reduction in acreage was noticed in every county.

in demand for bedding for horses, for packing fruit trees, pottery, etc. It is also used in the production of straw articles and paper. The grain can be used for flour, as food for domestic animals, and in the production of alcohol. All these latter demands are decreasing.

Potatoes.—The farmers in this section do not consider potatoes a profitable crop. They are grown largely to fill in certain vacant places in the labor schedule and for the farm table. The advantages for potato growing are (1) nearness to market, and (2) utilization of labor. The low yield of less than 80 bushels to the acre indicates that the debit side outweighs the credit. Maine produces over 250 bushels to the acre on the average. Soil is the predominant handicap here, the crystalline soils of the Piedmont being too heavy. Potatoes need a soil of light texture, such as prevails in the coastal plain areas. Monmouth County, New Jersey, produced over 165 bushels per acre in 1919. Chester County of the crystalline area harvested only 76 bushels per acre from the same acreage. The aggregate production of over 4,000,000 bushels in Monmouth County is greater than was harvested in this entire region. Variable prices give rise to another problem. It is easy to over-produce. This is a serious condition in an area of such low yields.

York is the potato county of this area (Table 33). Lancaster County produces the second largest amount, but in production per acre it is exceeded by Adams and Bucks. Both of these latter coun-

TABLE 33.—POTATO PRODUCTION, 1919 AND 1924

County	Acres		Production	
	1919	1924	1919	1924
Adams	1,964	1,471	170,669	115,584
Bucks	7,421	5,713	600,128	582,118
Chester	9,071	5,516	696,439	523,478
Delaware	1,681	1,148	100,232	136,906
Lancaster	11,840	8,978	961,514	917,738
Montgomery	4,666	2,517	287,900	218,039
York	12,305	9,941	1,098,832	957,544
Total	48,948	35,284	3,915,714	3,451,407

ties have large areas of sandstone soils that are favorable to potato culture for two reasons: they are low in price per acre, and are more productive for potatoes than the crystalline soils, and as much so as the limestone. About one-fifth of the acreage of the State is located here.

Tobacco.—This may be considered one of the special crops, for it is grown extensively only in Lancaster County. Today (1924) it harvests 91.3 per cent of the State output. Tobacco production is increasing in Lancaster County. Elsewhere it is decreasing and is of little importance (Table 34).

TABLE 34.—TOBACCO PRODUCTION IN PENNSYLVANIA AND LANCASTER COUNTY (1839-1924)

Year	State Pounds	Lancaster County Pounds	Lancaster County Percentage of State
1839	325,018	48,860	15.0
1849	912,651	378,050	41.4
1859	3,181,586	2,001,547	62.9
1869	3,467,539	2,692,584	77.7
1879	36,943,273	23,946,326	64.8
1889	28,956,247	19,217,800	66.4
1899	41,502,620	28,246,160	68.0
1909	46,164,800	36,892,869	79.9
1919	55,984,791	49,335,407	88.1
1924	56,353,741	51,468,470	91.3

Conditions in Lancaster County are very favorable for tobacco growing. The county has two types of soil favorable to the plant. The limestone is most important because it is better and most extensive. The alluvial lands along the Susquehanna terraces are very productive, however. These terrace soils have a fine, sandy composition. The moist atmosphere that prevails in the immediate vicinity of such a large water-course, and the fogs, help to prevent frosts in both the spring and the fall. The tobacco of these terraces is more useful for binders and wrappers than fillers.

Limestone soil is the key to success in tobacco production in Lancaster County. A glance at the map (Fig. 19) proves this, as does the fact that tobacco is grown but little elsewhere. Even in

York County, the second county in the State, the production is principally in the limestone sections of the York Valley. The limestone soil produces the cigar-filler tobacco, the famous Pennsylvania broad leaf, while the Penn and Lansdale sandy soils of the

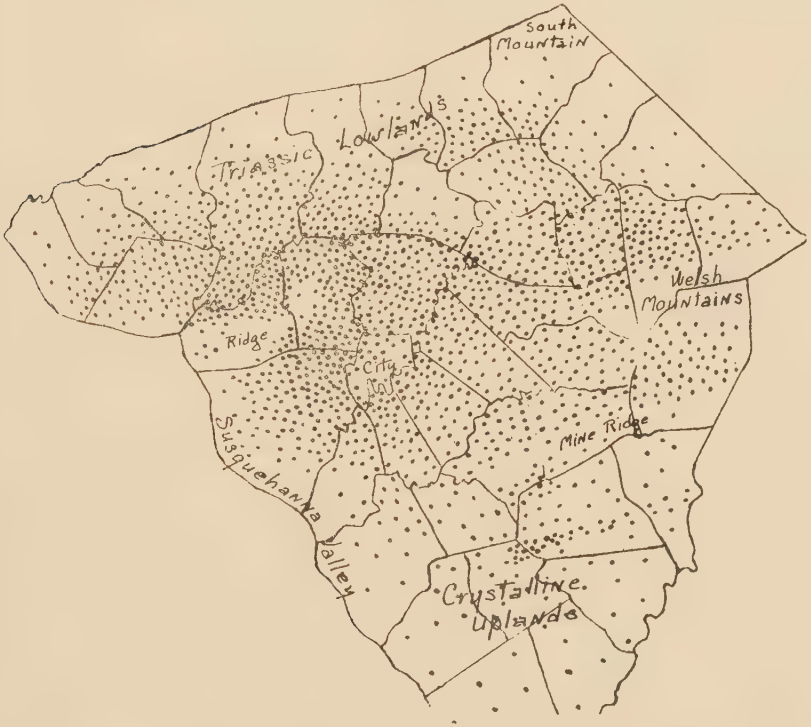


FIG. 18.—TOBACCO, LANCASTER COUNTY
.=25 acres

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. Tobacco and limestone soil are closely associated in Lancaster County.

north produce the Havana seed type or cigar and stogie wrapper tobacco. This appears to be due entirely to differences in soil. In a township soil analysis of Lancaster County in its relation to tobacco culture, it appears that the limestone soils will produce per acre at least 100 pounds more than the crystalline soils and over

200 pounds per acre more than the sandstone soils.[16] Greater care and more fertilization were also necessary in the latter soils.

The climate peculiarly affects the character of the tobacco produced. It overcomes soil and hereditary characteristics. Farm Bulletin No. 246[17] has the following statement: "Despite the great variety of soils and the wide range of topographic surface in the districts in Lancaster County where tobacco raising is important, no matter what variety of tobacco is introduced the leaf gradually becomes long and broad in shape and the flavor and aroma become mild." In southern climates the tendency is toward the production of a somewhat smaller, more aromatic leaf of heavier body, as is used in the cigarette, pipe smoking, chewing and export types.[18] The texture of tobacco grown on rolling land is finer than that grown on level lands. A rolling surface prevails here, even throughout the limestone area.

Favorable natural conditions no doubt caused the tobacco culture to develop steadily in Lancaster County, but economic factors are responsible for its localization. In Pennsylvania there appears to be no considerable development of organized marketing by the grower, nor any brokerage system by which this product may be sold satisfactorily. The buyer deals individually with the grower. He comes to the farm. This situation puts the isolated producer of a few acres of tobacco under a severe handicap. His marketing opportunities are decidedly limited. Packing co-operative associations have been organized in Lancaster County. Four of these are at the present time active. They are located in Mt. Joy, Lititz, Ephrata, and Mountville. These four companies have recently formed a central association in order to correlate their efforts in marketing and co-operative buying. Under the circumstances, more tobacco is grown in Lancaster County on inferior soils than elsewhere throughout this region.

Tobacco fits in well with the farming of Lancaster County. A well-balanced cropping system is practiced, which includes the

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[16] Townships used in this study (1924): Limestone: Upper Leacock, Leacock, East Lampeter, West Lampeter, Mannheim. Crystalline: Coleraine, Martic, East Drumore, Drumore, Fulton. Triassic: (Mixed Soil Region) West Cocalico, East Cocalico, Rappho, Mount Joy, Elizabeth.

[17] U. S. Department of Agriculture, Farmer's Bulletin, No. 246. (1910), p. 8.

[18] U. S. Department of Agriculture Year Book, 1922, p. 416.

growing of wheat, grass, clover and corn in rotation with tobacco. Feeding of steers is likewise very commonly associated with tobacco culture. Steers consume practically all the hay, corn and straw produced on the farm. Nothing is removed that will help to conserve the soil fertility. Feed is also purchased. The feeding of the purchased concentrates produces a manure very well adapted to tobacco culture. Dairying also fits in well with tobacco culture for the same reason. Animal feeding, likewise, furnishes an excellent seasonal distribution of labor. The following is a labor calendar of a tobacco farm under the livestock system.[19]

April.....Work on tobacco seed bed and steer feeding.
May.....Soil preparation for tobacco and corn. Seed bed care. Corn planting.
June.....Tobacco planting. Corn cultivation. Hay making.
July.....Tobacco and corn cultivation. Wheat harvest.
August.....Tobacco cultivation, topping and suckering.
September.....Tobacco suckering and harvesting.
October.....Tobacco curing. Wheat soil preparation and sowing. Corn harvesting.
November.....Tobacco curing. Corn husking. Steer feeding.
December.....Tobacco stripping. Steer feeding.
January.....Tobacco stripping. Steer feeding.
February.....Tobacco stripping. Steer feeding.
March.....Tobacco stripping. Steer feeding. Tobacco delivering.

Under this system the farmer is able to hire his labor for the year rather than during a short period in summer when labor is in great demand. This is a very important factor in the development of an agricultural district. The financing of steer purchases is accomplished by the associated tobacco industry. The feeders are mostly furnished during October and November. The money is borrowed from the local bank for five or six months. Cash must be paid at the yards. Tobacco is usually delivered during February and March. This delivery makes it possible for the farmer to retire his former note. No less than $2,000,000 annually is loaned for the purchase of feeders. Under the Lancaster County system there has been since 1899 a decided upward trend in yield. This is one indication of the soundness of the system.

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[19] Pennsylvania Department of Agriculture, "The Cigar Tobacco Industry in Pennsylvania," General Bulletin, No. 371, November, 1922, pp. 79-80.

Apples.—Apples may be considered the second of the special crops. Commercial apple culture is concentrated, to a large extent, in Adams County. In 1924 Pennsylvania produced 7,287,041 bushels. Over 7 per cent of these were grown in Adams County. When, in 1919, Pennsylvania grew 5,512,795 bushels, she took second place among apple-growing States. Adams, first among the counties, produced 742,196 bushels. The counties, important in the order named, Adams, York, Lancaster, Bucks, Chester, Montgomery and Delaware, produced 23 per cent of the State crop (1924).

This region should grow more apples. It has a wide range of topography and soil suitable for apple culture. Land of steep declivity or stony soil, or both—normally waste land—can be used for the growing of apples. Large marketing centers are nearby and accessible. Good apples can be produced here at a cost per bushel no greater than the price the growers of the Pacific States pay the railroad for transportation charges. Moreover, the Atlantic markets are growing ones. Climatic conditions are favorable. The growing season is long and danger from frost is relatively small. Steep slopes provide air drainage that diminishes still further the danger from frost. The ample rainfall here makes a juicier apple than the western one, and a more desirable apple in general if care and attention be given to it in proportionate amount. At the present time the marketing centers of this area are receiving large shipments of western and New York apples. The market appears to be capable of absorbing much more than the region is producing at present.

Regional Divisions.—The State is divided into five distinct apple-growing regions. This area lies in the southeastern district and the southern district.

Southeastern District: The territory embraced in this district extends from the Susquehanna to the Delaware River. It covers the area southeast of the foothills of the Alleghany mountains and includes the counties of Berks, Bucks, Chester, Delaware, Montgomery, Lebanon, Lancaster, the southern half of Dauphin, and the eastern portions of Cumberland and York.

This district is least hilly of them all. The limestone plains and the sandstone lowlands are the only areas of little relief, which is sufficient in most places, however, for adequate air drainage. Many acres of land can be used more advantageously for apples

than for crops or pasture. The growing season is longer than anywhere else in the State. Here are found the best markets, the most efficient transportation facilities, and an inherited tradition, for many famous amateur fruit plantations, nurseries and commercial orchards were begun very early.

Lancaster County: Apple orchards are so scattered that the county, although it produces more than Chester and Delaware, does

Fig. 19.—Apple Production as Related to Topography—Adams County, 1924
. = 1000 bushels

not impress one as being such an intensively developed apple region. Not long ago small farm orchards supplied the needs of the county. San José scale and neglect, however, have made it necessary to import apples. The farmers of the limestone region are more interested in corn, wheat and tobacco. In the rougher areas the new commercial orchards are beginning to develop. Here they have excellent air and water drainage. Diversified farming is more diffi-

TABLE 35.—NUMBER OF APPLE TREES IN THE SOUTHEASTERN DISTRICT
(1919 AND 1924)

Counties	Trees Bearing		Trees Non-Bearing		Total Trees		Produced in Bushels		State Rank in Total Number of Trees
	1919	1924	1919	1924	1919	1924	1919	1924	1919
Berks	181,309	187,949	96,869	135,908	278,178	323,857	152,314	216,364	5
Bucks*	120,980	122,686	65,844	56,095	186,824	178,781	152,404	110,769	16
Chester*	122,331	117,595	67,421	49,307	189,752	166,902	148,574	187,498	15
Delaware*	23,854	33,470	17,814	13,923	41,668	47,393	32,527	50,349	61
Lancaster*	124,431	147,618	98,191	71,953	222,622	215,571	169,244	145,153	7
Lebanon	54,695	55,871	26,892	34,142	81,587	90,013	67,257	50,337	52
Lehigh	67,400	77,232	39,722	34,205	107,122	111,437	120,867	107,719	43
Montgomery*	98,365	104,477	65,187	57,704	163,552	162,181	90,640	71,809	24
Northampton	65,178	61,674	25,586	26,117	89,764	87,791	81,706	75,441	50

* Counties included in this thesis.

cult in the rugged townships of the south along the Susquehanna, or on the slopes of South Mountain in the north. Land in these places is cheap, and as the crystalline lands alone cover over one-half of the area of Lancaster County, the space is ample.

Chester and Delaware Counties: Here, on these rolling hills of the Trenton Prong, are many excellent orchard sites. Conditions are impossible for permanent orchards, however, in the townships of Delaware County adjacent to Philadelphia County or the Delaware River. Uncertainty of tenure is the reason. At present the orchards are scattered throughout the two counties, but they are concentrated somewhat along the Chester-Delaware county line. In this region peaches and apples are grown frequently in the same orchard. The former was first given the most consideration. Market facilities are excellent. The production was greater in both counties in 1924 than in 1919. In Delaware County the industry is decidedly becoming more important. It has the better location of the two counties.

Bucks County: The apple business here is declining in importance. A quarter of a century ago this county was second in number of apple-bearing trees. There have been few plantings, however, and the industry is not in a healthy condition. Unsatisfactory drainage is a serious problem. The apple orchards lie in an east-to-west band that passes through the central part of the county, and along the hills bordering the Delaware River. Many excellent sites in the northern hill country are available. There is much room for growth in Bucks County.

Montgomery County: Here is an excellent fruit country that has not been developed. At present the principal orchards are on the hillsides bordering the Schuylkill Valley and its tributaries, particularly the Perkiomen. The largest commercial orchards are not over fifteen years old. Orchards are also being developed near Ringing Rock Park in the extreme north. The possibilities of apple culture have as yet hardly been touched.

Marketing in the Southeastern District: This region is of the local market type. During the 1920 season only 16[20] cars were shipped from the area. Many methods of disposing of the crop prevail. Huckstering and selling to consumers in the orchard are engaged in to a small and growing extent. Roadside market houses

[20] Pennsylvania Department of Agriculture, "The Apple Industry of Pennsylvania," General Bulletin 369, p. 179.

are becoming more and more common. The chief methods are selling to consumers at the retail market, or to retailers. For sales of the latter type the apples are packed in bushel baskets or crates. Motor-truck transportation is becoming common.

Apple growing should increase in importance, but appears only to have done so in Delaware County. The demand from the local market is not nearly met by the local supply. Small commissions and handlers' profits in this area make the fruit sales rather profitable to the producers. No lack of orchard sites and constantly improving transportation facilities are favorable factors. It is not uncommon today for orchards of 30 to 40 acres to sell nearly all the crop to automobile parties that come direct to the farm. Competition will be keenest from the neighboring orchards of New Jersey, Delaware, Maryland, New York and Virginia, or other sections of Pennsylvania. Greater care in packing, sorting and shipping is needed. Marketing methods are still crude. The industry needs leaders and more up-to-date advertising methods.

Southern Region: This is the most important apple region in the State. It includes the counties of Adams, Franklin, Cumberland and York. Most of the orchards here are on the foothills of the mountains, especially North and South mountains. The majority of orchards are from 600 to 800 feet above the sea. The greatest danger here is from spring frosts, but the excellent air drainage makes them exceedingly rare. It is the country of the Stayman-Winesap and Jonathan apples.

Two counties, Adams and York, produced over a million bushels of apples in 1919 and almost a million bushels in 1924 (802,-713), or almost twice the production of the other counties combined. Most of the orchards are located where the Piedmont and mountain topography join. A quarter of a century ago commercial orchards were almost unknown in this region. Now the most favorably located slopes are covered with orchards. This hill land is at present equal in value to the valley land. In 1914 nearly one-half the orchards were classified as non-bearing. The situation today (1924) is shown in Table 36.

York County: This county may well be divided into two sections. The northeastern portion has characteristics similar to those of Lancaster County. It is placed in the Southeastern Pennsylvania apple district, and like it is of the local market type. It is the poorest apple district in the county. The orchards have been

TABLE 36.—NUMBER OF APPLE TREES, SOUTHERN REGION, 1919[21] AND 1924[22]

Counties	Trees Bearing		Trees Non-Bearing		Total	
	1919	1924	1919	1924	1919	1924
Adams	254,228	443,413	280,355	154,041	534,583	597,454
Franklin	239,011	265,614	101,424	120,374	340,435	385,988
Cumberland	106,791	138,558	77,271	78,476	184,062	217,034
York	234,526	297,457	141,938	105,316	376,464	402,773
Total	834,556	1,145,042	600,988	458,207	1,435,544	1,603,249

neglected and the fruit has deteriorated. Auto trucks appear to be causing a revival of fruit production by enlarging the market. The remaining part of York County is engaged in commercial apple production on a large scale. A casual survey fails to give an adequate idea of the extent of this industry, for the orchards are scattered. No well-defined belt of good fruit soils and favorable topography exists. The entire county has possibilities. In addition to natural facilities the county has many small villages that are well scattered. Labor from these villages is usually cheap and easy to obtain. They also furnish a market for the second quality fruit. Peaches can also be grown here, and as they provide a filler in the apple orchard they are an aid to apple growing. Marketing possibilities are good.

Fruit farming is usually carried on in this county as an adjunct to general farming. This practice is likely to retard the development of the superior types of fruit, for superior fruit requires the undivided attention of the grower, one who is an expert. Crop planting frequently takes time needed for spraying and cultivation of orchards. Among the large commercial orchards is that of H. W. Anderson, of Stewartstown, containing 7,500 apple and 2,500 peach trees. There are at present about 100 commercial orchards in York County. These vary from a few hundred to several thousand trees, and are usually combined apple and peach

[21] Pennsylvania Department of Agriculture, "The Apple Industry of Pennsylvania," General Bulletin 369, p. 71, Table 16.

[22] U. S. Census Reports, 1924.

orchards. The average production (1919 and 1924) of York County was 293,412 bushels of apples, and 76,065 bushels of peaches.

Adams County: In this county most of the fruit grows on the foot hills of South Mountain (Fig. 20). Menallen Township in 1924 produced 164,776 bushels, or approximately 32 per cent of the county crop. The largest apple orchard belongs to the Tyson Brothers. It is located near Flora Dale (Menallen Township). It contains about 16,000 apple trees. Only a small number of orchards are located in the level lands near Gettysburg. The belt where "the apple is king and the peach is queen" extends from Jack's Mountain to York Springs, a decidedly hilly belt.

In this county fruit must be shipped as soon as it is harvested, on account of a lack of cold storage space. There are two cold storage houses in Adams County, one at Biglersville with a capacity of 242,000 cubic feet and one at Gettysburg, capacity 331,469 cubic feet. Only the first is used for fruit and vegetables. By-product plants are likewise few in number, there being only eight located here. The co-operative packing idea is yet in its incipiency. The smaller growers sell their product mostly in bulk to buyers or growers with packing facilities. Altogether there are approximately 150 commercial orchards in Adams County. It averaged 634,448 bushels of apples (1919 and 1924) and 84,563 bushels of peaches.

Soil Influences[23].—There is no question but that, for apple growing, elevation and at least a moderate degree of slope are valuable, as they afford freedom from frost pockets and provide surface drainage for air and water. Depth of soil is also important. Sufficient room for rooting, watering and feeding is necessary. Texture is also important. Extremely sandy soils dry too quickly and are wasteful of fertilizer in a humid climate, especially where the gradient is steep. Heavy clay soils are objectionable because they retain moisture too long. This causes difficulty in proper and timely cultivation. Most of the orchards of Adams County are found on the gravelly loam type. The stony loam and loam are also used. Trees benefit from rock fragments only to the extent that they may help in drainage and soil aeration. These gravelly and stony types are usually found on the foothills on slopes that

[23] Pennsylvania Department of Agriculture, "The Apple Industry of Pennsylvania, General Bulletin No. 369, pp. 138-51.

are climatically ideal for orchards. The latter appears to be the more important factor. These soils frequently have good depth, for the rocks on the tops and sides of the hills and ridges have been weathered and broken, and the spaces between filled with finely disintegrated rocks and organic matter that does not wash readily. If fertilizer is applied from time to time, the soil is productive.

Marketing in Adams County.—This is the car-lot region. The average haul, although shorter on the average than in the local market region, is more difficult because of steep terrain. Trucks cannot be used so successfully because of roads and grades; therefore, teams are still in use. There is less necessity for trucks in Adams County because the apples are all taken to market at one time and shipped in carload lots. The long hauls are dependent on good roads; otherwise roads are not a noticeable factor.

Adams County engages in the strictly commercial type of marketing to the greatest extent. Its apples are found in markets far removed from Pennsylvania, even as far as Liverpool, England. The principal shipping stations are Biglersville, Gettysburg, Bendersville and Guernsey.

Mushrooms.—Mushrooms are a third special crop. This culture is as much concentrated as tobacco and more than apples. Pennsylvania produces 85 per cent[24] of the mushrooms grown in the United States. The industry is confined almost entirely to the lower half of Chester County, in the neighborhood of Kennett Square, West Grove and Oxford. A few growers are scattered through Bucks, Montgomery, Delaware and Lancaster counties. The only serious competitors of the Chester County growers are those of Butler County, most of whom are located near West Winfield.

The industry has developed in Pennsylvania, not so much because of natural conditions as of marketing facilities. Suitable caves in Butler County were probably responsible for its introduction there, as the name Rocky Cave Mushroom Company indicates. The Alleghany County growers used the abandoned rooms of the Pittsburgh Limestone Company. An early start in Chester County developed a nucleus of a few old growers who were successful.

[24] C. R. Mason, "The Mushroom Industry of Pennsylvania," Pennsylvania Department of Agriculture, Bulletin No. 392.

This encouraged others to start in a small way. In this region there are a few large growers, but most of the men who are engaged in the business carry it on as an adjunct to other activities, such as general farming, dairying, or the growing of flowers and vegetables under glass. On one farm near Oxford (Chester County) mushrooms are associated with vegetables, the ratio being eight acres of vegetables to one of mushrooms. In Avondale Borough mushrooms are grown in connection with greenhouses. Mushroom houses are used here rather than caves.

This business is increasing. Fifty new beds of various sizes were constructed in 1924. The principal markets are the New York hotels and restaurants, which are supplied through New York commission men. Pennsylvania mushrooms are found in all large markets, as far west as Minnesota. The largest mushroom cannery is that of E. H. Jacob and Company (West Chester), which is a combined packing house and cannery. Certain grades are selected for canning, while the remainder are packed and marketed. The cannery has a capacity[25] of 80,000 cases a year packed for the foreign as well as the domestic trade.

Mushroom Farming.—There are two important types of mushroom farms in southern Chester County. Neither type produces mushrooms to the exclusion of everything else. The mushroom farm has an average size of slightly more than 50 acres, while the mushroom-dairy farm is usually a hundred acre farm or more. Both[26] are slightly smaller than the pure crop farm (123 acres) or the beef cattle farm (130 acres). The mushroom-dairy farm keeps 16 dairy cattle on the average, while on the mushroom farm there are approximately two. Both types of mushroom farmers devote some of their time to crops. To show this situation Table 37 is inserted at this point.

Income from Mushroom Farming.—Mushroom farming appears to be the most successful enterprise in this region (1923). Its income from various sources is clearly shown in Table 38.

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[25] C. R. Mason, Pennsylvania Department of Agriculture, Bulletin No. 392 (1924).

[26] Ezekiel, M., U. S. Department of Agriculture, Bulletin No. 1400 (1926). Size of Farms, South Chester County: Average, 1923—Beef Cattle ,130 acres; Crop, 123; Mushroom-Dairy, 115; Dairy, 105; Small Dairy, 78; Potato, 90; Poultry, 61; Mushroom, 58.

TABLE 37.—PERCENTAGE OF AREA IN SPECIFIED CROPS ON MUSHROOM FARMS[27]

Type	Pasture	Crops	Grain*	Corn Silage*	Hay*	Potatoes*	Specials*
Mushroom-Dairy	23	57	38	6	48	5.5	8
Mushroom	21	59	41	3	47	4.4	9
Dairy	22	58	44	7	43	4.9	6
Small Dairy	23	55	51	7	37	4.0	5
Crop	20	59	49	3	42	4.8	6

* Percentage of crop area.

TABLE 38.—SOURCES OF CASH INCOME ON MUSHROOM FARMS (AVERAGE)[28]
Comparison is made with other types of farming

Types	Number	CASH RECEIPTS FROM VARIOUS SOURCES WITH PERCENTAGES								
		Total	Crops	Percentage	Mushrooms	Percentage	Dairy Products and Cattle	Percentage	Poultry	Percentage
Dairy	270	$3437	$654	.19	0	0	$2412	.70	$292	.09
Small Dairy	38	2631	337	.13	0	0	688	.52	317	.25
Mushroom-Dairy	25	7432	977	.13	$3651	.49	2421	.33	312	.04
Mushroom	27	6406	356	.06	5069	.79	122	.02	343	.05
Crop	29	2598	1133	.44	0	0	688	.26	317	.12

[27] EZEKIEL, M., U. S. Department of Agriculture, Bulletin No. 1400 (1926), p. 9.
[28] U. S. Department of Agriculture, Bulletin No. 1400, Table 10, p. 13.

Cash receipts would be augmented if one considers produce used by the family, and decreased if the general cost of farm operations is reckoned on. An inventory must also be considered at the end of the year. This may include increases in the value of the livestock, crops on hand, machinery, or other equipment. Expenses on the average farm are indicated in Table 39.

TABLE 39.—AVERAGE CASH EXPENSES OF FARMS IN SPECIFIED GROUPS[29]

Item	Mushroom Dairy	Mushroom	Crop	Dairy	Small Dairy
Materials	$1,026	$456	$601	$891	$773
Labor	912	889	359	487	252
Services	223	101	197	204	128
Automotive	125	155	71	75	61
Real Estate Costs	469	714	300	390	435
Interest	169	55	111	121	85
Livestock	215	261	388	290	270
Direct Expenses on Mushroom Enterprises	1,612	2,651	0	0	0
Total	$4,771	$5,282	$2,027	$2,458	$2,004

The financial possibilities can now be summarized by bringing together all facts and incorporating them in Table 40.

It appears that the mushroom-dairy type farming is the most productive in this region. In comparison with the mushroom farm it was true relative to aggregate earnings, but the earnings per acre of farm were approximately the same ($12). This is another example of the benefit derived from utilizing larger farms. The larger the enterprise in crop farming, usually the larger the profits in a successful year and the larger the losses in an unsuccessful year. In the mushroom business, farms larger than 50 acres appeared to be the most successful.

Factors that make for success in the mushroom business are (1) favorable location—a more important factor to the mushroom grower than to most farmers, for large amounts of manure must

[29] U. S. Department of Agriculture, Bulletin No. 1400, Table 14, p. 15.

TABLE 40.—FINANCIAL RESULTS FOR SPECIFIED GROUPS OF FARMS[30]

Item	Mushroom	Mushroom Dairy	Dairy	Small Dairy	Crop
Value of Products	$6,884	$7,799	$3,843	$3,094	$3,277
Sold	$6,406	$7,432	$3,437	$2,631	$2,598
Family Use	268	332	274	306	308
Inventory Gains	210	35	132	157	371
Expenses	$5,213	$5,333	$2,829	$2,310	$2,554
Cash	$4,513	$4,133	$1,947	$1,484	$1,616
Family Labor	199	460	288	387	325
Use of Real* Estate and Capital	501	760	594	439	613
Operators Earnings and Perquisites	$1,617	$2,446	$1,014	$784	$723
Less Value of Own Labor	982	1,051	1,022	997	1,016
Management Earnings	$689	$1,395	$—8	$—213	$—293

* Interest computed at 6% on working capital and 4% on real estate.

be handled from freight car to farm; waste manure should also be near marketing facilities; (2) capital—mushroom production requires a heavy investment in buildings, and large expenditures for spawn, labor and manure; (3) marketing knowledge—the consumption of this product is not as yet common; (4) ability above the average—a factor more necessary in a combination mushroom and dairy farm than almost any other type of farming. If the work is well handled, there are good profits at present in the business. Increased production, such as this area is getting at a fairly rapid rate, may prove a boomerang. Italians, financed by some of the local banks, are entering the business in fairly large numbers. This is true of the small mushroom farms. Reports of many failures among them have been brought to my attention. The demand for mushrooms can be enlarged. It is increasing slowly, but a constant advertising campaign must be financed if the increase is to

[30] *Ibid.*, Table 16, p. 17.

continue. Increased demands for manure may present a serious problem. At present it comes from the cities nearby. In many ways this business is a highly speculative one.

Truck Products.—Farmers of this special type of farming have also the advantage of nearby markets, but the industry is handicapped because of the competition of the coastal plain soils of New Jersey. The crystalline soils of Southeastern Pennsylvania are too heavy and do not warm rapidly enough in the early spring. Early vegetables always command the highest prices. The coastal plain soils of this region are good vegetable producers, but the acreage available is decidedly limited. Favorable location along the Delaware River has placed the coastal plain lands in great demand for other than farming purposes. Such lands, available for farming, are extensively used for the production of vegetables. Tinicum Township (Delaware County) had its entire farm area of 14 acres in vegetables. Lower Darby Township in the same county has 230 acres of vegetables or 52 per cent of its harvested land. In addition 29 acres were sown in potatoes. This township combines nearness to Philadelphia with a coastal plain type of soil, two very favorable factors. Ridley Township adjacent to both the former townships had 40 acres of vegetables and 13 acres of potatoes harvested in the same year, 1924. This acreage was equivalent to approximately 30 per cent of its harvested farm land.

Southeastern Pennsylvania, including Philadelphia County, averages annually about 19,045 acres of vegetables (excluding potatoes.) This is .0229 of the total farm land. Gloucester County, New Jersey, has approximately the same vegetable acreage of 18,724, which was about .144 of its farm land. Delaware County averages about 2 per cent of its farm in vegetables, and Philadelphia County approximately 12 per cent. The situation is shown in Table 41.

Location appears to be the most important factor in determining the use to which land is put. Delaware County next to Philadelphia County has the most important location. These two counties utilized proportionately more farm land for vegetables (excluding potatoes) than any of the other counties (Table 41). Soil is also a deciding factor. The coastal plain soils of Philadelphia, Delaware and Bucks increased their relative importance as vegetable producers. Vegetables will do fairly well in the light-tex-

TABLE 41.—VEGETABLE ACREAGE AND PRODUCTION IN SOUTHEASTERN PENNSYLVANIA (Average Conditions, 1919 and 1924)

County	Vegetable Acreage	Percentage of Farm Land	Potato Acreage	Percentage of Farm Land	Production Bushels	Potatoes Acreage
Adams	2,096	.0076	1,779	.0065	146,935	80.9
Bucks	3,254	.010	6,505	.023	594,411	91.0
Chester	1,244	.003	7,344	.018	614,151	83.6
Delaware	1,120	.0173	1,420	.022	118,997	84.0
Lancaster	2,361	.0044	11,067	.021	994,575	90.0
Montgomery	1,962	.009	3,622	.016	254,540	70.3
York	4,955	.0095	11,278	.022	1,039,000	92.0
Philadelphia	2,053	.123	729	.044	92,170	126.0

tured, relatively sandy soils of the Triassic sandstone lowlands. Vegetables are the most valuable crop that can be produced on these types of soils. Their limited use for other agricultural products makes them frequently available for vegetables even when their location is not so favorable as that of other types of soils. This probably accounts for the greater proportionate importance of vegetables in York, Montgomery and Adams than in Lancaster County. Specialized crops, such as mushrooms, increase considerably the acreage returns in Chester County. It helps to overcome an undesirable soil condition.

A very successful method of raising vegetables in this region is in combination with dairying or other types of farming. This helps to take care of the labor situation by giving all-year-round employment, which helps to increase the total net returns. Vegetable production will increase here as market demands warrant, but conditions are such that the general market gardens will be more noticeably developed on the New Jersey coastal plain. There, land is less expensive on the whole and is also not so valuable for other products. Many of the coastal plain soils of Jersey are lighter in texture than any of the soils of this area.

Nurseries.—This again is a special type of business. In Pennsylvania, in 1920, nurseries covered 4,151 acres.[31] At that time this region included, within its borders, 2,226 acres, or 53 per cent of the entire acreage. This acreage concentration appears to be a

[31] Pennsylvania Department of Agriculture, July, 1926.

matter of location, for next to Chester County, the second county in the State is Philadelphia, with 898 acres. Include Philadelphia County in this area and the percentage rises to 75. The business has had a steady growth in the last six years. The State acreage amounted to 4,596.5 in 1926, or an increase of 10.7 per cent over the 1920 figure. In the same period this region increased its acreage by 11.9 per cent. At present (1926) there is located in this region over 54 per cent of the land of the State that is given over to nurseries. If Philadelphia County is included the percentage increases to 72. Philadelphia County lost approximately 100 acres of nurseries in the last six years. This is due to the continual growth of the city.

Chester County still retains the lead among the counties of the State, with 1,031.3 acres, or 22.5 per cent of the State acreage. Montgomery County, with 701 acres, has had the greatest increase of all the counties in the last six years. It increased 57 per cent in acreage. It is closing in on Philadelphia County very rapidly. Only 92 acres at present exist between it and second position. Bucks County is in fourth place with 424.6 acres. It has lost acreage since 1920. The seventh county is Lancaster. With an acreage of 161.4, it is exceeded within the State by Berks (168.7) and Erie (409.2) counties. Delaware County is twelfth with 75.5 acres. In proportion to farm area, however, it exceeds Lancaster County and Berks County. This fact further emphasizes the influence of the locational factor on the development of the nursery business. Adams County ranks thirteenth with 66.2 acres and York County is fifteenth with 31 acres.

The small nurseries are found in the inner zone surrounding Philadelphia. The Pericat Azalea Nursery near Clifton Heights, the Collins Nursery in Swarthmore, the Nullin Rose Gardens near Morton are all examples of the small nursery type. These are all located in Delaware County. Larger nurseries, such as the Bickmore Nursery near Chester (Delaware County) and the Somerton Nursery in Somerton (Montgomery County) are found farther removed from the city. The very largest nurseries, such as the Hoopes Bros. and Thomas Co. of West Chester; the Wm. H. Moon Co. of Morrisville, Bucks County; the Rakestraw Pyle Co. of Kennett Square, Chester County, and the Thomas B. Meehah Co. of Dresher, Montgomery County, do a wholesale and retail business and are justified, on account of cheaper land and good

transportation facilities, in keeping to the areas somewhat removed from the largest markets. West Chester and vicinity is the nursery center of this region. The prize nursery of this area is the Dupont Gardens located near Chadd's Ford. This is not a commercialized proposition, but its beauty and uniqueness can be enjoyed by the public through the kindness and consideration of its owner.

Crops in General.—Of all the crops, the cereals are the most important and the most widely distributed. The majority of farmers, no matter on what crop they are dependent for their cash income, plant some of their land to cereals. Cereals are usually associated with tobacco, apples, dairying, mushrooms, or beef raising. Hay is also a universal crop. A few vegetables and fruits are raised on practically every farm. The pure cash-crop farms, farms relying for most of their income on the sale of grain and hay, are relatively unimportant in this region. In a surveyed section[32] of Chester County, they equaled 7 per cent of the total number of farms. In a relative sense they are the least profitable type of farming. Western agriculture was and is exceptionally competitive in the cash-crop field.

Crop value again emphasizes the influence of soil on production. This study so far has brought out the superior importance of limestone among the soil types of this area. There is also a slight indication that the crystalline soils on the average are superior to the soils of the Triassic lowlands. A comparison of crop values (Tables 42 and 43) adds additional evidence in favor of the accuracy of the above conclusions. Lancaster County, of the limestone plain, has an acreage value of all crops of $76.30. Total crop land was considered as the basis for this computation. This was over $17.60 per acre greater than the acreage returns elsewhere. The Chester-Delaware area of the crystalline uplands, with a $57.10 per acre income, is superior to the Bucks-Montgomery area of the Triassic lowlands. The latter region had an acreage income of $45.05. These statistics are for 1919. The figures for 1924 cause no change to be made in this rating (Table 43).

If cereals alone are taken into consideration, the situation remains practically the same. Cereal production per acre is more

[32] U. S. Department of Agriculture, Bulletin No. 1400, p. 17. Survey covered 422 farms in southern Chester County, of which 29 were of the cash-crop type.

TABLE 42.—CROP VALUE COMPARISON BY COUNTIES (1919)

County	Total Value	Acreage Value	Acreage Value of Different Crops	
			Cereals	Hay
Lancaster	$32,192,000	$76.30	$58.20	$26.44
York	20,954,000	58.70	51.70	26.10
Delaware	2,348,000	58.70	49.50	42.20
Chester	14,567,000	55.50	52.30	37.10
Adams	10,619,000	53.60	48.50	22.60
Montgomery	8,636,000	47.00	46.70	33.40
Bucks	10,473,000	43.10	36.40	31.60

valuable on the limestone lands than elsewhere. The crystalline uplands are also superior to the Triassic lowlands. Hay is not grown extensively on the best land of Lancaster County. Farms are much too small and land is too valuable to be utilized for hay. Limestone land has been found to be good hay and grass land when so utilized. The Triassic lands, however, retain their lowly position in hay production as in cereals. Non-fertility of soil appears to be the predominant factor that accounts for this low position.

Fruit was found to be largely a hill crop. This is further emphasized by the fact that Adams County with almost a $2,000,000 crop was the most important county of this region in 1919. York County, also a decidedly hilly county, had in the same year a crop valued at slightly over $1,000,000. The remaining counties on the same basis had positions as follows: Lancaster, Bucks, Chester, Montgomery and Delaware. Special crops are the most important in Lancaaster County. Their total annual value was almost $9,000,000 in 1919. This value was mostly in the tobacco crop, as was the situation in York County, with $768,996 as the yearly income. Chester County reported in 1919 a valuation of $171,063. Elsewhere the production was relatively small, less than $50,000. Crops in this entire region were valued at approximately $100,000,000 in 1919. Of this value cereals were worth $48,000,000, hay and forage $21,000,000, vegetables including potatoes $15,000,000 and fruits $6,000,000. All other crops were worth $10,000,000. Crops in the census of 1925 were reported at approximately 56 per cent of their 1919 valuation.

TABLE 43.—CROP VALUE COMPARISON BY COUNTIES (1924)

County	Total Value	Acreage Value	Valuation of 1924 Crops as Compared to 1919[33] Crops (Percentage)
Adams	$3,958,203	$20.80	41
Bucks	5,423,016	24.08	59
Chester	7,500,112	29.50	59
Delaware	934,161	29.80	51
Lancaster	19,359,723	49.25	66
Montgomery	3,786,191	23.70	51
York	9,665,771	28.09	52

[33] Same crops.

VIII. ANIMAL INDUSTRIES

The livestock business, especially the raising of dairy cattle, is very important here. The "Geography of the World's Agriculture"[1] contains a map showing the distribution of dairy cattle in the United States. This part of the country is there indicated as being one of the three greatest centers of market milk production in the country. Livestock here was valued at $50,000,000 in 1919 and $35,000,000 in 1924. This was 50 and 68 per cent respectively of the value of the crops harvested in the same years. Cattle are the most numerous of all the animals. A comparative statistical study of the livestock industry of two important market milk producing areas is shown in Table 44.

Table 44.—Statistical Study of the Livestock Industry of Southeastern Pennsylvania and Southeastern Wisconsin (1925)[2]

Items	Southeastern Wisconsin Acres	Southeastern Pennsylvania Acres
Farmland	2,072,752	2,242,000
Pasture	555,031	293,000
Horses	68,000	79,000
Cattle	373,000	256,000
Dairy Cattle	348,000	203,000
Beef Cattle	25,000	53,000
Hogs	175,000	183,000

The Wisconsin district with one dairy cow for every six acres of farm land as compared to an eleven-acre area per dairy cow in this section of Pennsylvania, appears to concentrate more on the dairy branch of the livestock industry. In the first place, the Wisconsin territory has the advantage of the larger average farm. It has also been assisted to a larger degree by governmental, racial and educational groups. Climatic conditions are slightly poorer for

[1] Finch and Baker, *Geography of the World's Agriculture,* p. 124, Fig. 178.

[2] Wisconsin counties included are Greene, Jefferson, Kenosha, Racine, Rock, Waukesha and Walworth. (U. S. Census of Agriculture, 1925.)

crops in Wisconsin, but the summers are better for dairy animals. Less attention is also paid to special crops in Wisconsin.

Conditions, favorable and unfavorable, that influence the live-stock business here are as follows:

Favorable Conditions	Unfavorable Conditions
Dairying	
Excellent markets.	High prices for hay and grain.
Excellent pastures.	Small farm acreage (on the average).
Mild winter climate.	Heat and humidity of midsummer.
Large corn and hay crop.	Garlic in many pastures.
Winter employment.	
Nationality of the farmers (largely English and Teutonic).	
Hog Raising	
Good market.	High prices of concentrates.
Large corn crop.	Prevalency of cholera.
Abundance of garbage.	Competition of the market milk business.
	Lack of skim milk.
Beef Cattle Raising	
Good markets.	High prices of feed.
Large corn crop.	Small size of farms.
Excellent pastures.	Competition of dairying.
Ample hay and forage.	Competition of the corn belt.
Favorable climate.	Distance from feeders.
Fits into the farm schedule.	
Keeps up soil fertility.	
Sheep Raising	
Good markets.	High price of land.
Excellent pastures.	High price of feed.
Plenty of rough land.	Small farms.
	Competition of dairying.
	Parasites.
	Dogs.
	Competition of the West.
Poultry	
Excellent markets.	Competition of small flocks (everywhere).
Mild climate.	
Production of home supplies.	
Spare time business.	

Dairying[3].—Delaware County is the greatest dairying county, if a farm land basis is considered, although in actual number of dairy cattle on its farms it is last. On a farm land basis the counties[4] in order of their importance are: Delaware, Chester, Montgomery, Bucks, Lancaster, York and Adams.

Eighteen per cent of the dairy cattle of the State are located here on 12 per cent of the farm land. In dairying the northeastern part[5] of the State of Pennsylvania is almost as important as this area. This is statistically shown in Table 45.

TABLE 45.—STATISTICAL STUDY OF THE DAIRY INDUSTRY OF SOUTHEASTERN AND NORTHEASTERN PENNSYLVANIA (1924)

Section	Cows Milked	Milk per Cow	Milk Produced	Milk Sold	Value of Dairy Products
Northeastern	145,777	557	82,000,000	55,000,000	$13,000,000
Southeastern	166,677	548	93,000,000	69,000,000	17,000,000

Both regions make a specialty of market milk. This southeastern section produced a two-year average (1919-24) of approximately 88,500,000 gallons of milk and sold about 77 per cent of it. Northeastern Pennsylvania produced 75,000,000 gallons the same period and disposed of 76 per cent as market milk (57,000,000 gallons). The production of milk per cow averaged 11½ gallons greater in the northeast. These are the two most important dairying regions of Pennsylvania. Delaware, Chester and Montgomery counties have the greatest concentration of dairy cattle per acre of farm land of any of the counties of the State. In Southeastern Wisconsin, every county considered had a greater concentration of dairy animals than had Delaware, the premier county of Pennsylvania. The average in the Wisconsin region was about 6 acres per dairy cow (1924).

[3] See previous chapter for a discussion of the early history of dairying.

[4] County rank in farm acreage per dairy animal: Delaware 7.6, Chester 8.4, Montgomery 9.3, Bucks 11, Laancaster 11.3, York 13 and Adams 16.8 (1924). Number of dairy animals per county in 1924: Chester 46,926, Adams 16,242, Lancaster 46,193, York 36,932, Bucks 28,094, Montgomery 21,926, Delaware 7,151; total 203,464.

[5] Number of dairy cattle in Northeastern Pennsylvania, in a section that includes Bradford, Susquehanna, Tioga, Wayne, Wyoming, Sullivan and Lackawanna: 193,000 cattle on a farm area of 2,000,000 acres (1919).

On the average, the dairy farm, in one of the best dairying areas of Southeastern Pennsylvania, namely, Chester County, near the Delaware State line, pays better than the general crop farm. Mushroom and mushroom dairying were found to be more profitable but more speculative. The latter also required more skill and

FIG. 20.—COWS, CHESTER AND DELAWARE COUNTIES
•=25 cows

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. The suburban and industrial sections are not necessarily the greatest dairy areas, although they are located adjacent to the Philadelphia County line.

native ability and was in greater danger of overproduction. This is likely to be true of all special crop farms. The dairy farm was found to be the most common type in the region, however. Slightly less than 78 per cent[6] of the farms were dairy farms. This would be approximately the condition in Chester and Delaware counties,

[6] U. S. Department of Agriculture, Bulletin 1400, p. 12, Table 9.

with the percentage decreasing gradually through Montgomery, Bucks, Lancaster, York and Adams counties. Almost all the farms surveyed[7] in the South Chester County area had a few dairy cattle on them.

FIG. 21.—DAIRY CATTLE, LANCASTER COUNTY
.=25 cattle

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated.

The large dairy farm of 61 to 75 acres in Chester County was[8] more profitable than the dairy farm that contained 46 to 60 acres. There were 48 of the former as compared to 76 of the latter type

[7] *Ibid.*

[8] See previous chapter.

in the region that was surveyed. The average operator's income of the large dairy farm was $1,047 as compared to an income annually of $969 on the smaller dairy farm (1923). Overhead per unit is greater on the small farm. Utilization of labor profitably is

FIG. 22.—BEEF CATTLE, LANCASTER COUNTY
•=25 cattle

The number of dots in each township is correct according to statistics taken from the United States Census returns of 1925. The present location of the dots within the townships has been only approximated. Limestone land and beef cattle appear to be closely associated.

also more difficult. Retaining the fertility of the land is likewise more of a problem on the small farm.

There are several reasons why dairying has become important in Southeastern Pennsylvania: (1) The dairy cow economically converts pasture grasses, dry and succulent roughage and the by-

product of many different kinds of grain into milk. For food eaten the dairy cow returns more than three times as much digestible products as the steer, and more than twice as much energy in edible products.[9] This intensive type of farming was made necessary by the keenness of western farm competition and the increased demand for special farm products. (2) Farms in this region were losing their fertility by constant usage and poor management. In order to maintain soil fertility it is necessary to keep livestock on the farm. The amount of fertilizer ingredients sold off a farm where the right proportion of livestock is kept, is so slight that the amount brought to the farm in the form of purchased concentrate feed often more than compensates for the loss. The yield of crops on farms where dairy cattle form an important part of the farming enterprise has been maintained and frequently increased.[10] (3) Many persons have been encouraged to try dairying because the enterprise was stable and the income regular. The price of dairy products is usually uniform from year to year as compared with the price of other farm products. Dairying also cannot be expanded rapidly. Only a slow growth is possible. Favorable years have not stimulated production to a point where overproduction seriously retards future progress. (4) Dairying makes possible the utilization of labor to advantage. (5) It also furnishes a cash income as a side line if only a few dairy animals are kept. A yearly income well distributed is usually associated with dairying. (6) Dairy cattle when undesirable for milking purposes can be slaughtered. These together with the veal calves from the dairy herds of the country furnish more than ¼ of its beef and veal supply. These sales furnish an additional item of income. Capital stock can be increased and additional income produced through the sale of pure-breed dairy cattle. These conditions have offered an additional stimulus to the development of the industry. In summing up the situation one finds that this region has developed an important dairying industry because of its favorable relation to the production of crops, its favorable influence on soil fertility, its favorable possibilities in regard to seasonal distribution of labor, its favorable total income when compared to most other types of farming, and its favorable stabilizing influence on agriculture in general.

[9] U. S. Department of Agriculture Year Book, 1922, pp. 282, 283.

[10] U. S. Department of Agriculture Year Book, 1922, p. 283.

Factors Influencing Cow Population.—Along this line soil influence is a very minor factor. The greatest influence is nearness to market. In general, the closer the market the denser the cow population. Table 46 is added at this point to further emphasize the importance of the locational factor in determining the cow population.

Topographic Influence on Cow Population.—It appears that Chester Valley, with its excellent valley farm lands and its very favorable location, should be a more promising dairy region. Casual observation would indicate that the very hilly nature of parts of the townships that make up the Chester Valley has helped to reduce the cow population of these townships (Fig. 20). The fact that Adams County farmers had in 1924 only one cow to nearly 17 acres of farm land further substantiates this idea. This is an amount so much larger than any of the other counties that more than remoteness appears to be responsible for it. Adams County has the most severe topography of them all. From all indications topography, unless severely rough, has but little influence. In this respect, it is in this region no more important than soil. It appears, however, that the rougher the country the larger number of acres of pasture needed to take care of one cow. In Adams County two acres are required. Delaware County, rougher than Chester County, requires 1.8 acres as compared to 1.6 acres in the latter county. Lancaster County, with one-third of its area a limestone plain, requires only 1.4 acres (Fig. 21). If beef cattle are also included, the amount of pasture land per cow in Lancaster County is much lower. Similar to Lancaster is Bucks County, in respect to requiring a small acreage of pasture land per cow. The latter county is also classified among the counties of small relief. This supposition is further substantiated by a study of the situation in Lancaster County.[11] The low-lying limestone lands utilize only one acre for each dairy animal, while the southern crystalline territory uses 2.2 acres for each one. Low-lying limestone land is too valuable for pasture. When so used, however, these lands are excellent grass producers. This is an established historical fact and is illustrated by such areas as the Kentucky Blue Grass and

[11] Ten townships in Lancaster County, five in the limestone belt and five in the crystalline belt:

Limestone, pasture land, 6,041 acres; dairy animals, 5,921.

Crystalline, pasture land, 9,993 acres; dairy animals, 4,513.

TABLE 46.—COW POPULATION IN RELATION TO LOCATION AND SOIL

Areas	Soil Type	Acreage of Farm Land		Location
		Total	Each Animal	
Delaware County	Coastal	6,616	7.0	Excellent
Philadelphia Gneiss	Crystalline	134,155	8.1	Very Favorable, 1
North Chester County	Crystalline	128,841	10.0	Favorable
Southwestern Chester County	Crystalline	109,622	8.2	Very Favorable, 2
Schuylkill Valley, Chester County	Triassic	31,828	7.1	Excellent
Chester Valley, Chester County	Mixed	40,412	9.1	Very Favorable, 2
Bucks County, Coastal Plain	Coastal	43,357	12.7	Favorable
Bucks County	Triassic	93,978	9.4	Favorable
Bucks County (North)	Mixed	29,790	13.2	Less Favorable
Lancaster County	Limestone	63,662	10.5	Favorable
Lancaster County	Crystalline	67,558	15.0	Not Favorable
Lancaster County (North)	Mixed	42,431	13.6	Less Favorable

the Shenandoah Valley of Virginia. This soil factor is further emphasized when two regions of topographic similarities are compared. The Triassic lowlands of Bucks County have 1.5 acres for each dairy animal. This is a slightly greater acreage than is used in the limestone area. Beef cattle raising, if included, would make the comparison still more favorable to the limestone.

Production per Cow.—On this basis a study of the counties shows that, in a large way, position influences the matter. The regions remote from the concentrated dairy area near Philadelphia, such as the counties of Adams and York, had the lowest production per cow in the last three census years.

TABLE 47.—STATISTICAL STUDY OF AVERAGE MILK PRODUCTION PER COW IN THE COUNTIES OF SOUTHEASTERN PENNSYLVANIA (1909, 1919, 1924)

County	Milk Production per Cow
Adams	350
Bucks	530
Chester	555
Delaware	540
Lancaster	566
Montgomery	562
York	448

The other counties of this region were all more favorably situated and they also reported larger milk production per cow. Lancaster County was slightly higher in production per cow than locational conditions warranted. The limestone soil and favorable topographic conditions increased the Lancaster County average. That these are factors, has been brought out by a survey[12] of the farm situation in Lebanon County immediately adjacent. In that county the sale of milk per cow in the limestone belt averaged 6,323 pounds, while in the other soil belts the average was only 5,592 pounds. The German farmers of the limestone region seemed also to appreciate more the value of high-grade cattle than did the farmers of the other soil belts of Lebanon County,[13] for the selling price of the cows and heifers purchased and sold was higher. Stall feeding was also more common in the limestone townships of Lan-

[12] State College Agricultural Experiment Station, September, 1925, Bulletin No. 198, "Agricultural Production and Marketing in Lebanon County," p. 18.

[13] *Ibid.*, p. 18.

caster County. This would tend to increase the production per cow. Delaware County, with a most excellent location, much better than either Bucks or Lancaster, did not do justice to that position. The uncertainty of tenure, due to land speculation near the city, and the small size of the farms in comparison with Chester County, are factors that would tend to lower the average production per cow. In the dairying region of greatest concentration the best herds are usually found on the larger farms. These are frequently large herds, and a few miles farther to transport the product is no hardship, for the superior product can better stand transportation charges. The price of land is also less in the outer zone of profitable dairying. This outer zone cannot, however, be too far removed from the market. The other counties rank approximately as they should from a locational point of view.

Climate and Dairying.—With a rainfall of over 45 inches, well distributed, and with little danger of severe droughts or storms, this region is an excellent hay and pasture region. The long growing season, combined with the mild winters, makes for more extended use of outdoor pastures and produces a minor problem as to winter housing. Hot, humid days in midsummer prevent this section from having an ideal climate for dairying. According to O. E. Baker,[14] it is the cool summer temperatures that favor a low bacterial content in the milk. He also states that low temperatures and high summer rainfall promote pasturage of high quality which is best utilized by dairy cows. Fortunately, however, the undesirable type of weather is not usually continuous, but is broken into periods of a few days each. The favorable rainfall, together with the physical nature of the rocks, which allows for seepage and storage, gives rise to many springs and permanent streams. An ample water supply is an essential adjunct to dairying. Natural factors, excepting climate, are, however, but minor influences in the development of dairying in this region. The regions of greatest production are the regions of marked locational and transportation advantages. This is true almost without exception.

Beef Cattle.—Beef cattle are important in this region only in Lancaster County. This county contains over 60 per cent of that type of cattle found in this area. Among cattle they are in the

[14] Baker, Oliver E., "Agriculture Regions of North America," *Economic Geography*, Vol. II, No. 4, October, 1926, p. 464.

minority. They equal 21 per cent of the total cow population. This industry appears to be a declining one (see previous article). In Lancaster County it is confined almost entirely to the limestone soil regions. This fact is distinctly shown on the beef cattle map (Fig. 22). The fattening of cattle is a business that is secondary, even in this region, on most of the farms. It makes an excellent winter occupation and consequently fits well into the yearly labor schedule. It also helps to utilize the feed crops of the farm, with the result of retaining the fertility of the soil. In fact, a great many beef cattle are fattened solely to keep up soil fertility, the value of the manure affording the principal profit from the enterprise.

Beef cattle in 1919 in Lancaster County were valued at almost $3,500,000. Tobacco at 18c[15] per pound, the prevailing price in the same year, was valued at $10,000,000, or practically three times the value of the beef animals. In fact, the value of the tobacco crop was only $4,000,000 less than the value of all the domesticated animals in Lancaster County. Adams County, although it has 644 fewer beef animals than Chester County, has a larger percentage of all cattle of that type. Its percentage is 21. The advantageous factors pertaining to the development of this industry in Adams County are: (1) Large areas of rough but suitable pasture land, with level lands nearby that are available for growing corn. Many fruit growers maintain average herds of ten head. (2) The location of a small limestone area near Littletown and McSherrystown. In this section beef cattle are raised for the same reasons as in Lancaster County. In Chester County, where the cattle are only 10 per cent beef animals, the number of purely beef cattle farms is small. Southern Chester County had three such farms out of 422 farms that were surveyed.[16] These farms were large, averaging over 130 acres. They should rightly be called crop farms, with beef cattle fattening to fill the winter labor schedule. The number of beef cattle on these farms averaged 17.8. The typical farm in Chester County, however, has no beef cattle or sheep. The Iowa type of steer fattening cannot compete successfully with dairying on the farms of this area except in the best agricultural regions. On many farms of large size, where the amount of permanent pasture is larger than can be used advantageously by dairy animals, steers can be pastured and fattened profitably. In other situations

[15] Pennsylvania Department of Agriculture, Bureau of Statistics, 1919.

[16] U. S. Department of Agriculture, Bulletin No. 1400, April, 1926, p. 1.

it does not pay. In southern Chester County the operator's earnings for the year 1923 were $96 on the beef cattle farms, on the average. This was less than the operator[17] could have obtained elsewhere for his own labor.

In Sioux County, Iowa, the land of the beef animal, 70 per cent of the cattle were beef cattle. In Lancaster County, the premier county of Pennsylvania, the percentage was only 42. In regard to number (1924), Sioux County had over 46,000 as compared to 33,000 in Lancaster County. There were approximately 10 acres of farm land in the former county for each steer as compared to 16 acres in Lancaster County. In the limestone belt[18] of the latter county, however, the acreage per animal (beef) was only 8.6. This fact indicates a greater concentration in the best parts of Lancaster County than in one of the best counties of Iowa.

Swine.—Hogs[19] numbered 183,000 (1924) or 23½ per cent of the hogs of the State. This was fewer hogs than the region possessed in 1910. Adams County, second in the actual number of hogs, is really the premier hog county of this region (Table 48). Hogs are the best type of animals to raise in a fruit country, for they can be pastured in the orchards more successfully without ruining the trees. Many fruit farms have as many as 25 hogs to each 100 acres of orchard. The average in Adams County is approximately 22.[20] This can be done in this county because most of the orchards are hillside orchards, and to prevent erosion are kept in sod. More skim milk is also available in Adams County than in Chester, Delaware, Montgomery or Bucks. This is due to the small comparative percentage of milk sold directly for consumptive purposes. York County, with nine acres per hog, has developed the industry under conditions similar to that of Adams County. The small percentage of hogs in Chester County in proportion to the acreage of farm land (25 acres for each hog) is due to the market milk industry that has developed there. This business

[17] U. S. Department of Agriculture, Bulletin No. 1400, April, 1926, p. 19.

[18] Limestone soil townships of Lancaster County considered were seven in number. Their combined farm acreage was 89,434 acres and their beef cattle numbered 10,387 (1925).

[19] Early history, with causes for the decline in the industry (see previous chapter).

[20] Pennsylvania Department of Agriculture, General Bulletin 369, July, 1922, p. 67.

takes the farmer's time and furnishes no extra waste milk. Delaware and Montgomery counties, although premier market-milk regions, have a greater hog population proportionately than either Lancaster or Bucks County. This condition is due to the establishment of piggeries in regions where garbage is available on a large scale and its disposal paid for by the cities or suburban boroughs.

TABLE 48.—HOGS IN THE COUNTIES OF SOUTHEASTERN PENNSYLVANIA, 1924

County	No. of Hogs	Acres of Farmland per Hog
Adams	33,208	8
York	48,133	9
Delaware	5,030	11
Montgomery	18,392	11
Lancaster	43,283	12
Bucks	19,381	16
Chester	15,609	25

York County, the county with the largest number of hogs, has only one-third as many hogs as Sioux County, Iowa. In fact, Sioux County has within 28,000 hogs of having as many as all the counties of this section of Pennsylvania. Hog population in proportion to farm land in Sioux County is approximately one hog for every three acres, as compared to one hog for every eight acres in Adams County. Hogs do not fare so well in this comparison as beef cattle in Lancaster County. The hogs of this area are, however, more valuable than the beef cattle, although in Lancaster County the value of the beef animals is almost three times greater.

OTHER LIVESTOCK GROUPS

Horses.—In this region horses are an accessory of farming. They are not raised extensively for commercial purposes. Horse breeding is carried on, but only to replenish farm stock. The average number on each farm is two. In Sioux County, Iowa, the average is six (1924), but the number of acres per horse is approximately the same.

Sheep.—These animals are relatively unimportant (for reasons see previous chapter). They are more important relatively in Delaware County than elsewhere, although Chester County contains the largest number. Sheep in Sioux County, Iowa, are rela-

tively and actually more important than they are in any of the counties of this region.

Poultry.—This industry is most profitable as a side business. It usually occupies a minor place on most farms. The poultryman always finds himself in competition with small flocks everywhere that are kept by the farmer's wife or the family of the suburban dweller. The poultry business in the aggregate, however, must be taken seriously. The receipts from the sale of chickens and eggs in 1919 equaled $10,000,000. This was approximately the value of the tobacco crop. It was only slightly less than one-half the receipts from the sale of dairy products. Poultry on January 1, 1920, was worth nearly $6,000,000, or almost twice the value of the beef cattle. In Adams County the receipts from the sale of chickens and eggs were greater by $165,000 in 1919 than similar receipts from dairy products.

Poultry value appears to decrease the greater the distance from marketing centers. Montgomery, Bucks and Delaware County poultry is worth more per acre than that of Adams, York or Lancaster County. A larger number of poultry farms are found in the counties adjacent to the large markets such as Philadelphia, Chester and Trenton. Receipts likewise show the same local relationship, with the single exception that the receipts per acre in Lancaster County are large enough to place it in second place, equal to that of Bucks County. The situation is shown in Table 49. The industry is increasing in importance. With the single exception of Delaware County, more chickens were produced in this region in 1924 than in 1919. The egg output was greater in all the counties.

Animal Products.—Dairy products, on the average, are the most valuable of all the animal products. Chickens and eggs in 1924 were slightly more valuable than the dairy products. They were the only animal products that were more valuable in 1924 than 1919. This was due to the fact that they were more plentiful in 1924. The average value of all animal products is approximately $40,000,000. Table 50 indicates the distribution of the value of the animal products among the different counties and between the different products.

On a farm acreage basis in 1919, Montgomery County led with a $27 acreage value, followed by Delaware $25, Chester $20,

TABLE 49.—POULTRY VALUES IN THE SOUTHEASTERN PENNSYLVANIA REGION (1919) COMPARED WITH DAIRY PRODUCT RECEIPT VALUES

County	Value of all Poultry		Total Receipts from Sale of Chickens, Eggs	Receipts per Acre	Receipts from Dairy Products
	Total	Per Acre			
Adams	$494,000	$1.83	$996,000	$3.60	$831,000
Bucks	1,067,000	3.20	1,547,000	4.65	3,283,000
Chester	769,000	1.80	1,152,000	2.75	5,868,000
Delaware	173,000	2.90	195,000	3.25	1,264,000
Lancaster	1,288,000	2.30	2,564,000	4.65	4,852,000
Montgomery	951,000	3.90	1,594,000	6.50	3,777,782
York	1,026,000	2.00	2,188,188	4.20	2,585,196

TABLE 50.—VALUE OF ANIMAL PRODUCTS IN SOUTHEASTERN PENNSYLVANIA (1919 AND 1924)

County	10% of Value of Animals		Value of Dairy Products		Value of Chickens and Eggs		Wool Value	
	1919	1924	1919	1924	1919	1924	1919	1924
Adams	$425,000	$289,000	$915,000	$730,000	$1,300,000	$1,370,000	$11,000	$6,000
Bucks	634,000	454,000	3,345,000	2,499,000	2,100,000	3,013,000	4,000	3,000
Chester	900,000	610,000	5,962,000	4,514,000	1,700,000	2,198,000	15,000	6,000
Delaware	233,000	94,000	1,263,000	644,000	400,000	287,000	5,600	1,000
Lancaster	1,421,000	1,012,000	5,051,000	4,306,000	3,500,000	4,972,000	16,000	8,000
Montgomery	607,000	376,000	3,828,000	2,247,000	2,200,000	2,301,000	6,000	3,000
York	909,000	639,000	2,803,000	2,250,000	2,800,000	3,595,000	8,300	5,000
Total	$5,129,000	$3,474,000	$23,166,000	$17,192,000	$14,000,000	$17,736,000	$65,900	$29,000

Lancaster $18, Bucks $18, York $12 and Adams $9. The importance of the animal industry again appears to be based principally on the locational factor. The general money valuation of animal products was slightly more than 40 per cent of the region's crop valuation (1919). Their comparative value had increased to approximately 70 per cent in 1924.

In 1919 six counties of Illinois located near Chicago produced animal products that were valued at approximately $20,000,000. The farm acreage of the Illinois counties equaled 2,215,810 acres, as compared to an acreage of 2,242,000 in this region. Dairy products were over twice as valuable here, chickens and eggs more than three times as valuable, and domesticated animals slightly less than twice as valuable, as in the selected region of Illinois. Southeastern Pennsylvania likewise shows a superiority in crop valuation. Her crops in 1919 were valued at $100,000,000, as compared to approximately $76,000,000 in the Illinois area. Illinois counties' cereals were $13,000,000 more valuable, however, than those of this area. The hay crop in Southeastern Pennsylvania exceeded by $7,000,000, the vegetable and potatoes by almost $14,000,000, and the fruits and nuts by over $5,000,000.[21] similar crops in the Illinois country. Practically nothing was realized from special crops in this Illinois region, while at the same time the farmers here produced special crops that were valued in the neighborhood of $10,000,000.

TABLE 51.—VALUATION OF ANIMAL PRODUCTS IN SELECTED ILLINOIS COUNTIES (1919)

County	10% of Value of Animals	Value of Dairy Products	Value of Wool	Value of Chickens and Eggs
De Kalb	$750,000	$950,000	$35,500	$670,000
Du Page	403,000	2,509,000	8,000	496,000
Kane	751,000	3,808,000	20,000	540,000
Kendall	318,000	274,000	11,000	287,000
La Salle	863,000	1,000,000	36,000	1,178,000
Will	638,000	1,473,000	6,775	943,000
Total	$3,723,000	$10,114,000	$117,275	$4,114,000

[21] Illinois Counties: Crop value $76,000,000; cereal value $64,000,000; hay and forage value $14,000,000; vegetable and potato value $1,231,000; fruits and nuts value $250,000.

IX. CONCLUSIONS

It appears from the foregoing chapters that certain physical and human factors have determined the development of agriculture in Southeastern Pennsylvania. It is perhaps well in closing the record to recall to mind its salient features:

1. *The combination of physiographic factors is propitious.* It is a land of topographic and soil diversity with a remarkable uniformity of climatic conditions that are decidedly favorable for the development of successful agriculture. This varied physical setting, combined with its advantageous position on the seaboard of a great continent, its great river highways and its favorable colonial policy so ably advertised by Wm. Penn, attracted at an early date a plentiful variety of settlers. The Welsh were pleased with the hilly uplands near Philadelphia. It reminded them of their native land. The hills and valleys were also attractive to the Scotch-Irish. They were the descendants of a highland people. They knew the hill country and loved the isolation and freedom of its protecting mountain walls. Poor soil to them appeared no serious drawback. The frontier life was to their liking, consequently the unoccupied Triassic plains of Bucks County, the more rugged parts of Lancaster, York and Adams counties, then somewhat removed from the centers of English and Welsh settlements, appealed to their inmost nature. The Germans were the valley and plains people. Their former habitat had been the rich and fertile lowlands of the German Palatinate. Heavy stands of white oak and black walnut were to them indicators of a fertile agricultural soil. The limestone plains of Lancaster County, heavily forested, well watered and slightly rolling, made it unnecessary for them to seek farther for the promised land. The diverse natural endowments made it possible for them to make the most of this rich variety of natural resources, whether in forest, quarry or field.

Stone, plentiful and fairly easily worked, made possible the many stone houses and barns that were and are being erected in the crystalline uplands. Gneiss, quartzite, marble, limestone, serpentine and sandstone have all seen service in building construction. Road metal is also a product of the quarries. Its abundance

here made improved road construction, at an early period, feasible. Hard roads have been a boon to the farmer. They have increased his marketing facilities and decreased his isolation.

Philadelphia itself is partially the product of this favorable natural setting. Natural trade routes focused at Philadelphia. Water power in early days was abundant, as was also wood and food. Minerals and fuel could be easily and cheaply obtained. Building material was at all times abundant. Manufacturing, throughout the entire region, was the product of its varied natural wealth. Pockets of iron ore were found associated with the limestone. Water power was plentiful and widely distributed. Timber was available for charcoal. Natural clay beds were located along the lower river valleys. Feldspar from the pegmatite dikes of Chester and Delaware counties could be utilized. Kaolin, the product of decomposed feldspar, was available. Lime for the making of lime-plaster was practically unlimited. Water transportation, both natural and artificial, made additional power and fuel minerals easily obtainable. Mining at first was only a part-time job. It was most important during the slack farming season. It was thus important as an adjunct to agriculture, and at the same time it was furnished a cheap labor supply. This development and growth of manufacturing influenced decidedly the trend of agriculture through the growth of markets and the continuous development of transportation.

2. *The diversity of agriculture is outstanding.* The greatest returns are derived from cereals, a certain amount being produced on almost every farm. Straight-crop farming, uncombined with anything else, is not generally successful. Combinations such as tobacco, beef cattle and cereals, mushrooms and dairying, fruits, cereals and livestock, dairying and crop culture, nurseries and mushrooms, vegetables and poultry, are a few of the farming types that are fairly successful. The farmer attempts to diversify, because of varied natural conditions, in order better to handle the labor problem, to keep himself busy throughout the year, to make easier the solution of his problem of fertilization, and to take advantage of the demands of a large and growing market.

The farm land of the area is largely in crops (71 per cent). Crops cover less than 60 per cent in Delaware County, but over 75 per cent in Lancaster and Montgomery counties. Iowa has 66 per cent of its farm land in crops and Illinois 69 (1924). Pasture

land amounts to 13 per cent, ranging from 10 in York County to 25 in Delaware County. In Illinois pasture land equaled 23 per cent and in Iowa over 28. Woodland here amounted to 13 per cent of the farm land, as compared to 7 in Iowa and 9 in Illinois (1924). Adams County has the largest timber acreage. York County has more of its farm land in woods than any other county. Less than 2 per cent of the limestone farm areas is in woods.

Crops in this region under normal conditions are approximately the value of the animals plus the value of all the animal products. In 1919, crops were worth one hundred million dollars, as compared to ninety-two million dollars, the combined animal and animal product value. The cereals are almost as valuable as all the other crops combined. The principal crops in the order of their importance are hay and forage, vegetables including potatoes, corn, wheat, tobacco, fruits and oats. Hay, wheat and corn, of all the crops, occupy the largest acreage. The relative importance of corn and wheat depends upon the year and price. They are usually planted on approximately the same acreage, and this acreage is slightly less than that utilized for hay. Crops in seven Illinois counties near Chicago were much greater in value in proportion to the combined animal and animal product value than in this region. The ratio in the Illinois area in 1919 was 76 to 47. Crops, however, were less valuable there by twenty-four million dollars. The cost of production was much less in the Illinois region. The cereals were less valuable here. The ratio in 1919 was 61 to 48. In hay and forage this region was superior. Vegetables and fruits were minor crops in Illinois, but major crops in Southeastern Pennsylvania. This section far outclasses these northern Illinois counties in the raising of tobacco, mushrooms and other special products. Dairy products in value are usually superior to the value of any single crop. From a value basis, the rank of the products of Southeastern Pennsylvania is cereals, dairy products, hay and forage, vegetables including potatoes, chickens and eggs, wheat, corn, tobacco, fruits and flowers.

3. *Varied in nature are the farmer's physical problems.* At first this diversified physical environment was utilized with great similarity throughout. Although man found a tree growth fairly well adjusted to its habitat, he made little attempt to profit by this example. Immediate adjustment in a new land is rarely possible. Familiar agricultural practices are the first to be introduced. Only

through continuous failure are they discarded. The early settlers were predominantly agriculturalists. They had for a long time hardly any other alternative than to make their land produce practically everything needed for the family. Under the circumstances only minor adjustments were possible, and these were frequently only the result of trial and error. Slightly different, however, were the problems that confronted the early settlers of one part of this region from those of other sections. In the limestone lands the heavy stands of hardwood timber demanded greater effort and perseverance in clearing the land for farming. The Swedes, coming early, occupied the lowlands along the Delaware and Schuylkill rivers. These lands were the easiest on which to make settlements. They were practically untimbered, and the great natural river routes that led into the interior were made a medium by which trade with the Indians was developed. The suitable lands of this nature were limited, which fact demanded that late-coming groups occupy more remote lands that compelled a greater initial effort, which in the long run was rewarded by superior returns. Not all the intrinsically favorable agricultural land was immediately occupied or settled previously to much inferior areas. Propinquity to important centers of population was, even in those days, a most vital factor in determining sites for settlement. As population increased, it spread, until all sections were somewhat developed. The farmer of the uplands found himself confronted with problems of hillside erosion that gulleyed his land and removed the soil if it was not attended to; problems of fertilization that were constantly pressing, due to the thin and acid soil that covered his land in many places; problems of surplus stone removal, the intensity of which can be clearly seen even to this day in the numerous stone fences throughout the countryside. Problems just as serious but of a different type fell to the lot of the settler in the sandstone and shale lowlands, the so-called Triassic lowlands. Here erosion was a minor factor that was decidedly subordinate to the problem of drainage. Although the soil was thicker on the sandstone lowlands, it was inherently infertile and demanded almost equal attention. Diversity within the Triassic areas frequently produced varied agricultural problems, even on adjacent farms. The trap rock sections, the land of the stony loam, were in many places worthless for agriculture because of the rock masses of all sizes that covered the ground. On these hilltops and hillsides the soil was also thin

and susceptible to drought. Good crops could be produced only with much effort. Frequently, in places, the rocks prevented the downward percolation of water. Its escape laterally caused soggy and untillable soil elsewhere that had to be drained in order to be utilized. Limestone plains, although essentially fertile and otherwise favorable for agricultural activity, presented problems that demanded consideration. The question of fertility for many years after settlement was not pressing. Limestone near at hand and easily quarried makes, and always will make, that problem a simple one. Drainage, except in a relatively few areas, was naturally well taken care of by the underground streams and the slightly rolling nature of the country. At times and in certain places, however, too much of the rainwater was carried away. This was a serious matter, only in times of severe drought, a rather infrequent occurrence here. Stones and thin soil were not frequently agricultural drawbacks. On a small number of farms, a very limited acreage contained limestone outcrops that developed into slightly stony and thin-soiled areas. The heavy and thick soil was not easily worked. The problem of horse power and adequate machinery was consequently more serious in the limestone region than elsewhere.

Many of these problems still confront the farmers of these different regions today. Their relative importance, however, has changed. It is at present the absence of a sufficient timber supply rather than a surplus that handicaps the farmer. Near the centers of population and in the most fertile areas the forests have practically disappeared. Woodlots rather than extensive forests prevail in this region. Only in Adams County has the State seen fit to establish forest reserves. The passing of the forests has intensified erosion. Much land was cleared that should have remained tree-covered. Practically nothing is being done today to remedy this error by forest-tree plantings on undesirable farm lands. Fruit culture is becoming more and more important in regions of strong relief. But still large areas are under the plow that are fit more for pasture or tree crops. In such regions, the labor outlay, the expense of retaining soil fertility, the small returns per acre, make farming of the old type a losing proposition. Sad is the appearance of a deserted field in these regions of strong relief. Fertilization, as well as erosional problems, has become more intensified throughout the area. Today this land that has

been farmed for almost two hundred years, and frequently farmed in a wasteful manner, demands constant attention. Many farms that are at present on the market at a very low price per acre are either worn out, contain unproductive soil derived from such rocks as serpentine or are too rough and stony for successful cultivation. The productivity of the soil on some of these farms could also be improved by drainage.

4. *Economic problems,* the results of the rapidly expanding urban population, the opening up of the Middle West, the improvement of transportation facilities, and misdirected production, are demanding constant modifications of agricultural plans and policies. Successful farming is beginning to necessitate a high degree of intelligence. The farmer of this region today should know what nature has done to make profitable farming possible on his particular area of land and throughout the region; how to take advantage of his natural environment; what crops to produce and in what proportion in order to make the best possible use of his land and his labor; what products are in greatest demand in his local markets and the best methods of disposing of his surplus products. He must not only be a high-grade producer but a high-power salesman as well. He needs more assistance from governmental and educational groups. Co-operative marketing is just beginning to be developed. The farmers' attention must more frequently be drawn to the enlightening and well-worth-while studies of the United States Department of Agriculture, the State Department of Agriculture, the State Experiment Stations, and the County Agricultural Agents. The farmer here must become an expert, for the days of the simple crop farming have passed.

Capital is also becoming more and more of a factor in successful farming in this region. One of the most profitable types of farming is the combination dairy-mushroom type. The farms of this kind are larger than the average. They require for successful operation large capital outlays in addition to a high degree of managerial and executive ability. Tobacco and beef cattle are another successful combination in the limestone areas that demands ready capital or credit at opportune times. With almost unexcelled facilities for the growing of apples, the industry is still in its infancy. Western apples produced under an expensive irrigation plan, and shipped across a continent, are successfully competing with Southeastern Pennsylvania apples in their home market.

Trees could be grown here to advantage on hundreds of acres of neglected land. They would not only increase the income of the farmer but help to prevent erosion and make more simple the problem of drainage. Fruit culture requires a long period of waiting for returns. It also requires expert handling and marketing. Skill, experience and capital are also demanded of the successful horticulturist. Oats is an expensive crop to produce in this region but is still produced on approximately 7 per cent of the crop land. The increasing cost of producing western wool will soon make it advisable to increase the number of sheep here. Efforts at stimulating the industry have not been very successful. The hesitation on the part of the farmer is primarily due to a lack of knowledge of their care, to losses from disease and the dog menace. This is an excellent region for the production of the so-called "hot-house" lambs. According to the U. S. Department of Agriculture, these lambs usually bring fancy prices. They are expensive to produce, as much grain and special care are needed.

The principal reasons for agricultural failures appear to be over-exploitation, lack of operating funds, limited experience in handling specialized crops, poor management, lack of marketing organizations and the neglect in soil and crop relationships. The specialized type of farming always faces a limited demand and a quickly glutted market. Too many producers of certified milk, guaranteed eggs, mushrooms and hot-house products make these industries very hazardous and highly speculative for all. A change in demand, such as has recently been noticed among tobacco growers, may necessitate crop readjustment and temporary hardships. Too frequently success along one particular line has a tendency to invite serious competition. Men have all too often engaged in a type of agriculture with which they were not familiar and with insufficient capital. Such has been the recent experience of many of the Italians in the mushroom industry.

5. *Conditions for successful farming are favorable.* In all climatic phases, in their relation to agriculture, this is the most favored region of the State. Its high mean annual temperature, its hot, humid summer, its long growing season, its fairly abundant and well-distributed precipitation, its lack of frequent and extensive dry spells, its comparative freedom from destructive storms, and its fairly mild winters are all advantageous to agriculture.

Few places in the country have quick and easy access to such large and numerous markets. No farm is over three miles removed from an improved road. Railroads, both steam and electric, are more numerous than economic conditions within the area warrant, for here is located one of the great crossroads of the continent, and one of its greatest centers of population. The advantages accruing from its favorable position have not been fully realized.

Its soil and topographic conditions are on the whole favorable. On 10.8 per cent of its agricultural area, the region of the limestone plains, natural farming conditions are excelled in but few localities in the United States. In addition to the 306,752 acres of limestone, the so-called Class A land, there are approximately one million acres of slightly inferior land. Class B land can be considered as including about 40 per cent of the area of the entire region. Sandy, thin and stony soils, together with large areas of rough, stony land, lower the agricultural possibilities of the remaining acres. Land of exceedingly strong relief, of high stone content, and of very low natural fertility, the so-called waste land, amounts to no more than 10 per cent of the land acreage. The problem of correct land utilization has so far been given but little consideration. The method of attack has principally been that of trial and error.

From all indications this region can be put in the good farming class. In the production of market milk, it is exceeded only by certain sections of Wisconsin and New York. In the production of mushrooms it has practically a monopoly. It can favorably be compared with other regions in the quantity of apples, tobacco, corn, wheat and nursery products per acre. The poultry industry is exceedingly important although widely scattered. Beef cattle are important only in Lancaster County. It is decidedly outclassed in the production of oats, vegetables, barley, flax and rye and in the raising of hogs and sheep. Its crops in value in 1919 and 1924 exceeded acre for acre those of the States of New Jersey, South Carolina, Iowa, Connecticut, Maryland, Wisconsin, Kansas, Florida and North Dakota. The condition of agriculture here as compared with farming throughout the nation is fairly good. Farm conditions nowhere appear to be at par. The agricultural ebb, the aftermath of the prosperous war period, has not as yet completely disappeared. The region has qualifications that make for successful agricultural endeavor if properly utilized. The limestone area is

the region that is best equipped along agricultural lines. Lancaster County owes its prestige and prosperity to the abundance of limestone within its borders. There is little to choose between the crystalline and the Triassic areas. Their relative position depends upon the individual farmer, the location of the farm, the size of the farm and the type of product. They both make fairly good general purpose farm lands. Acre for acre, the first agricultural county is Lancaster and the least important county is Adams. Bucks County is but little superior to Adams. The remaining counties are so closely bunched that their correct ranking is impossible.

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